

# Vodafone Technology

## Investor Briefing

*June 2021*



# Agenda

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## Welcome & introduction

*p3*

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**1** Our customer demand continues to accelerate

**Johan Wibergh**  
*Chief Technology Officer*

*p9*

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**2** We have a strong technology roadmap

**Scott Petty**  
*Digital and IT Director*

*p18*

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**3** We allocate capital to drive returns

**John Otty**  
*Group Financial Controller*

*p36*

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**4** We are transforming to deliver growth

**Johan Wibergh**  
*Chief Technology Officer*

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*Appendices*

*p64*

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# Vodafone Technology : A globally scaled operator



34 thousand  
employees



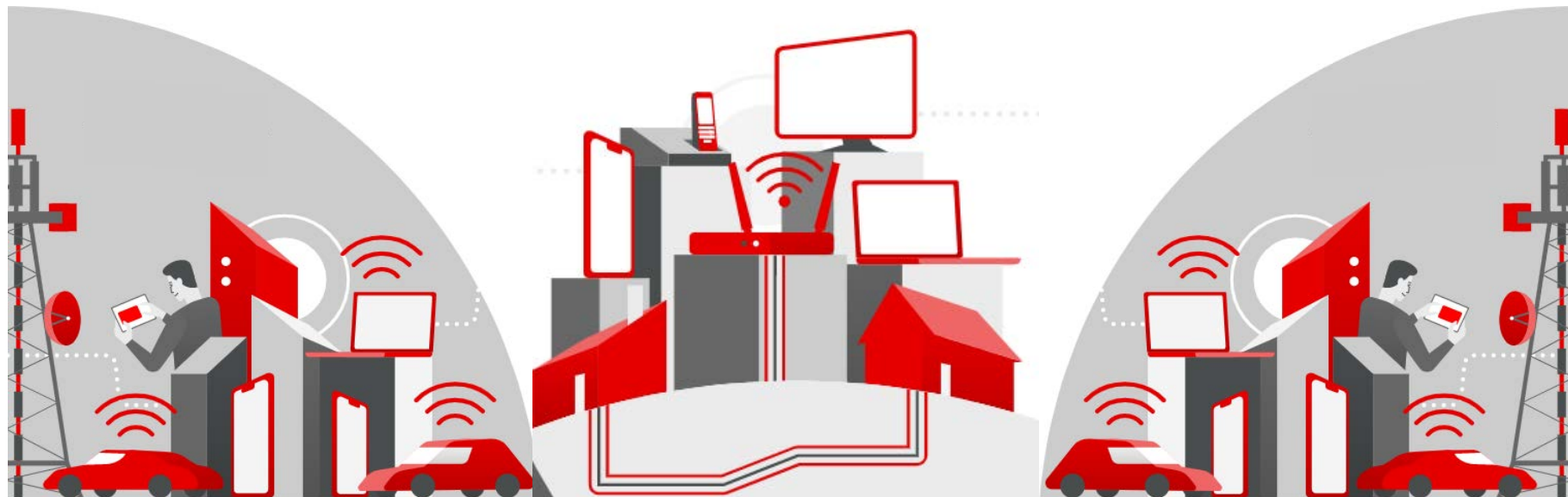
>400 million  
connected  
devices



>140 million  
NGN homes  
passed



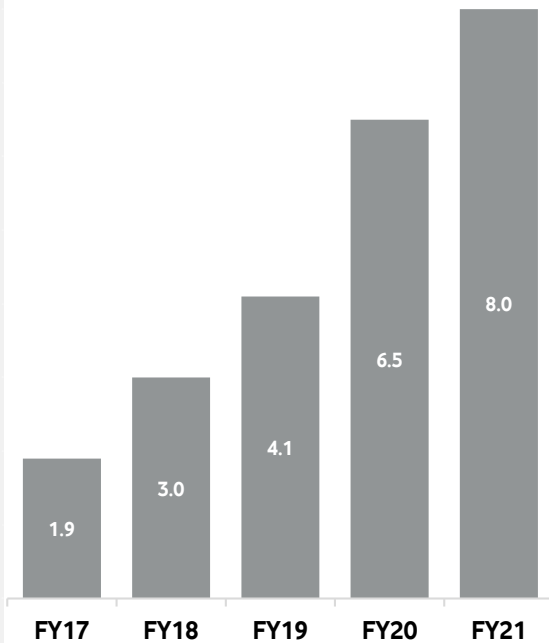
21  
countries



# 1 : Our customer demand continues to accelerate

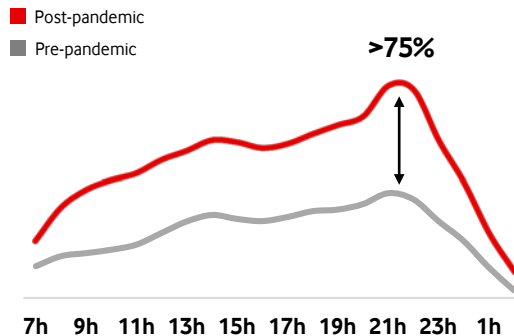
## Customer usage is growing rapidly

Europe mobile smartphone data usage  
(GB/customer/month)<sup>1</sup>

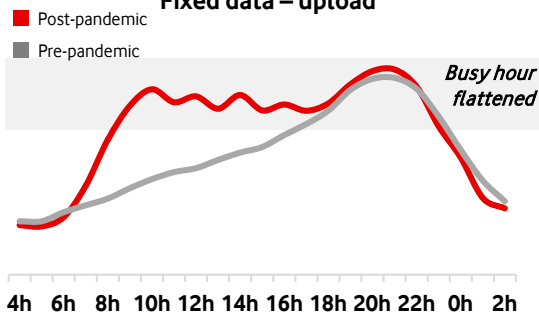


## Networks are critical for work

### Mobile data



### Fixed data – upload



## Demand drivers

### Consumer



4K video streaming



Cloud gaming



Consumer IoT



Financial services



Download and cloud file storage



Video calling



AR/VR services

### Business



Enterprise in the cloud



Big data/AI analytics

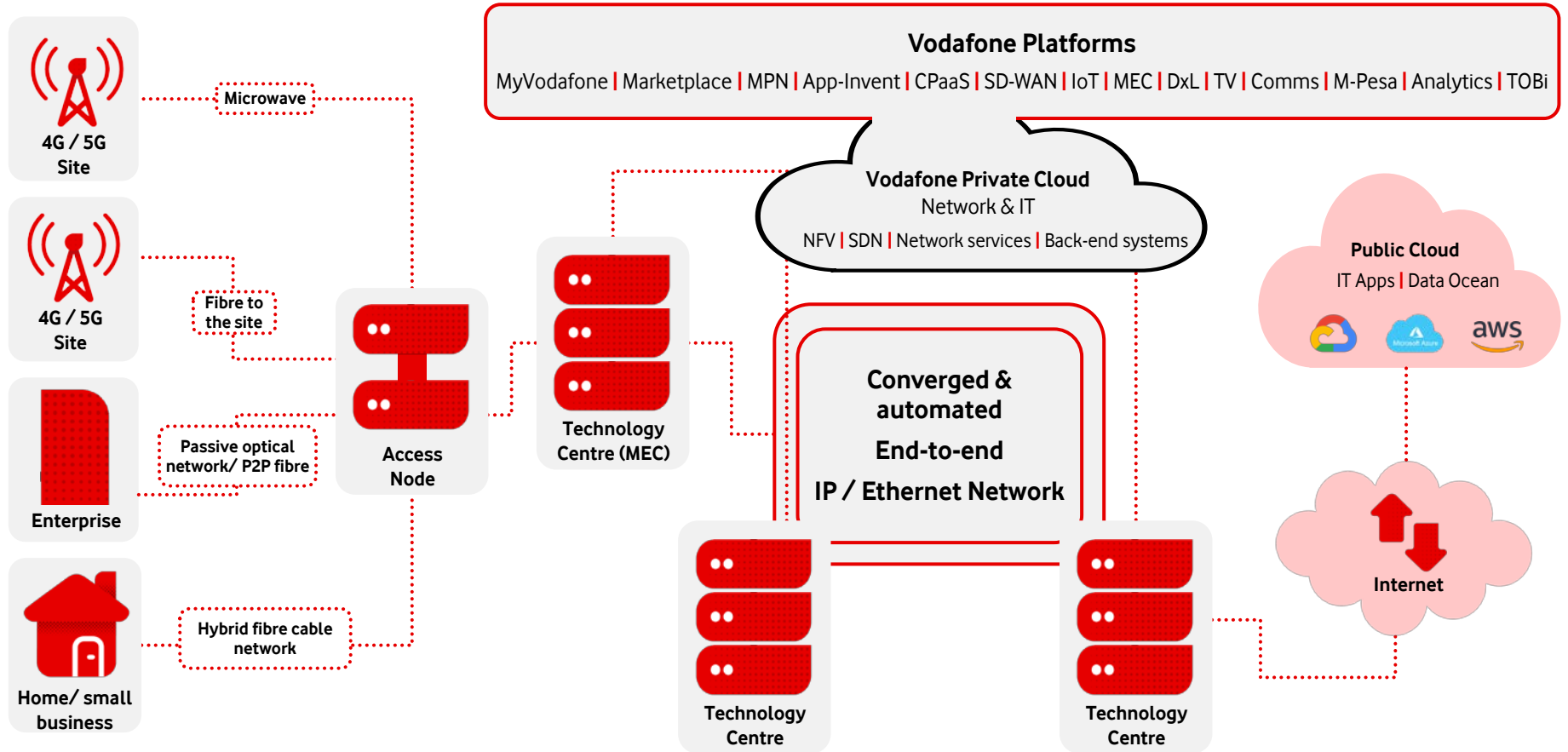


Unified communications



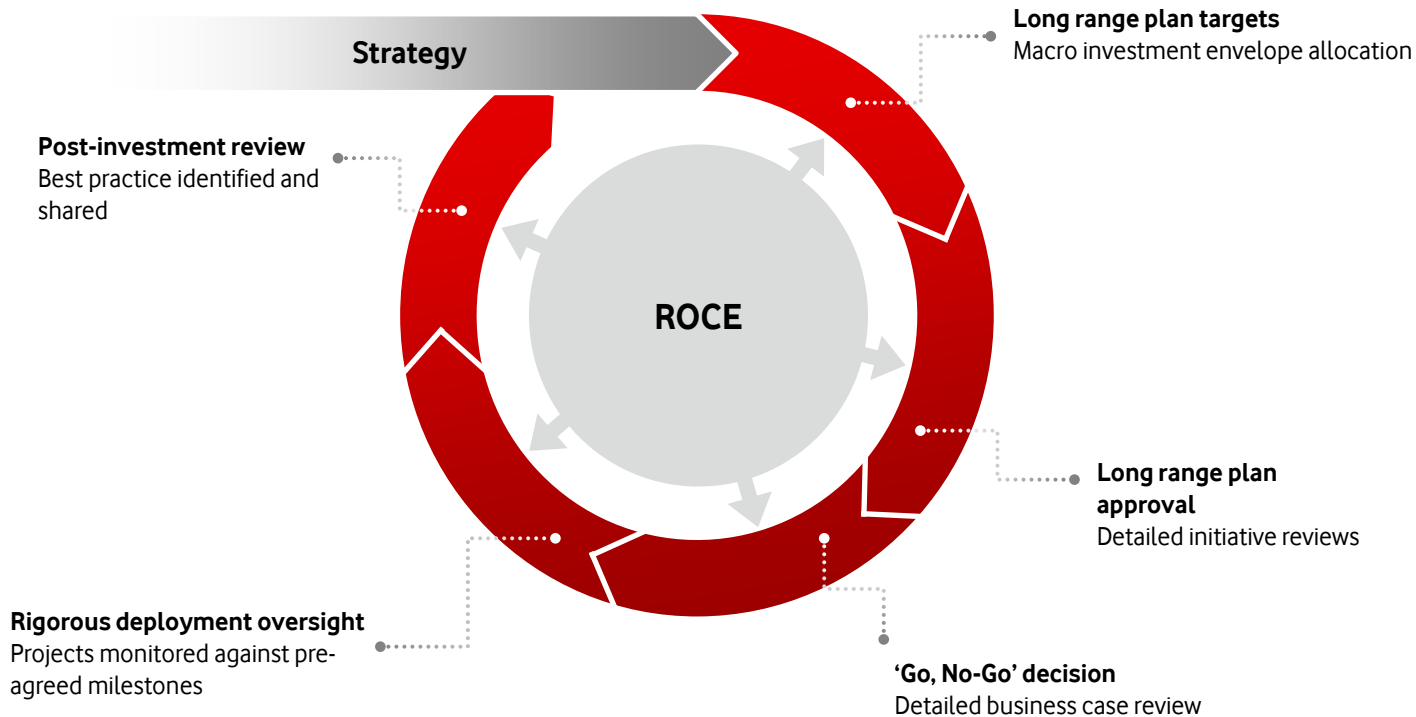
Low latency services

## 2 : We have a strong technology roadmap



# 3 : We allocate capital to drive returns

## Capital allocation review process built around ROCE



# 4: We are transforming to deliver growth

## Tech:2025

### What we'll look like



Reliable, high-speed & efficient convergent networks



Always-on & zero-touch operational excellence



Most efficient and simplified operator



Product operating model & scaled platform architecture with standard APIs



Culture of innovation & collaboration, embedding leading practice

### Our ambition



60% 5G built-right population coverage, >51m on-net gigabit homes in Europe



80% of network incidents automated end-to-end



Data volume growth met or exceeded by cost per GB reduction



50% reduction in product lead times



Enabling consistent revenue and ROCE growth

# Our vision : The new generation connectivity & digital services provider

## We connect for a better future

### Our Purpose

#### Inclusion for All

Ensuring everyone has access to the benefits of a digital society

#### Planet

Reducing our environmental impact and helping society decarbonise

#### Digital Society

Connecting people and things and digitalising critical sectors

### Our Vision

The new generation connectivity & digital services provider, growing in Europe and Africa

### Our Strategy

Deep & trusted customer relationships



Best connectivity products & services



Leading innovation in digital services



Outstanding digital experiences

Enabled through Group scale & expertise



Simplified & most efficient operator



Social Contract shaping the digital society



Leading gigabit networks

### The Spirit of Vodafone

Earn customer loyalty

Create the future

Experiment & learn fast

Get it done, together



# 1 : Our customer demand continues to accelerate

**Johan Wibergh**  
*Chief Technology Officer*



## Key messages : Our customer demand continues to accelerate

**A** Our customer demand has accelerated over the last year

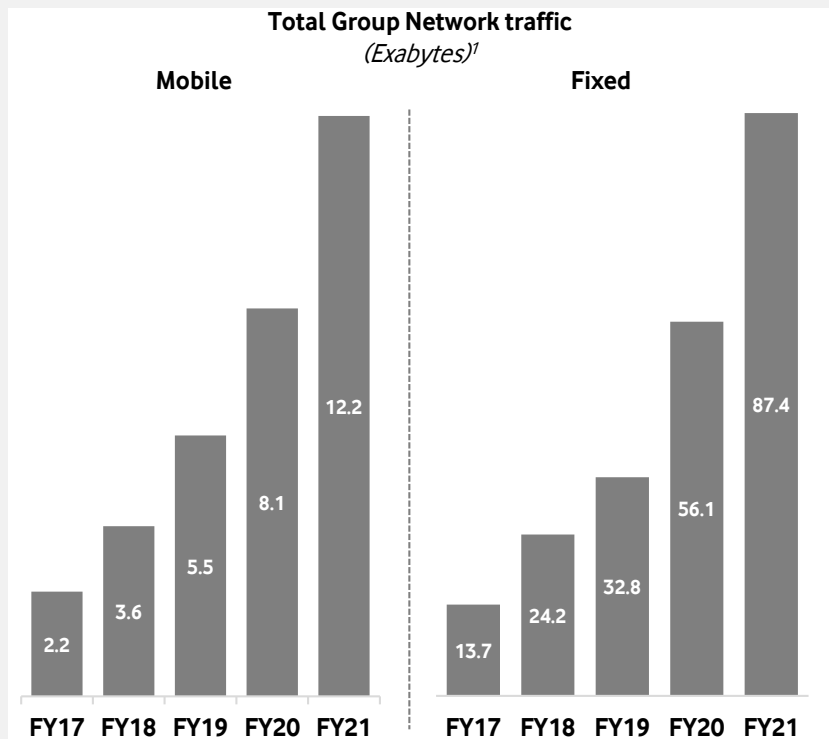
**B** Cloudification of communication is driving data growth

**C** Device and service proliferation will drive further demand

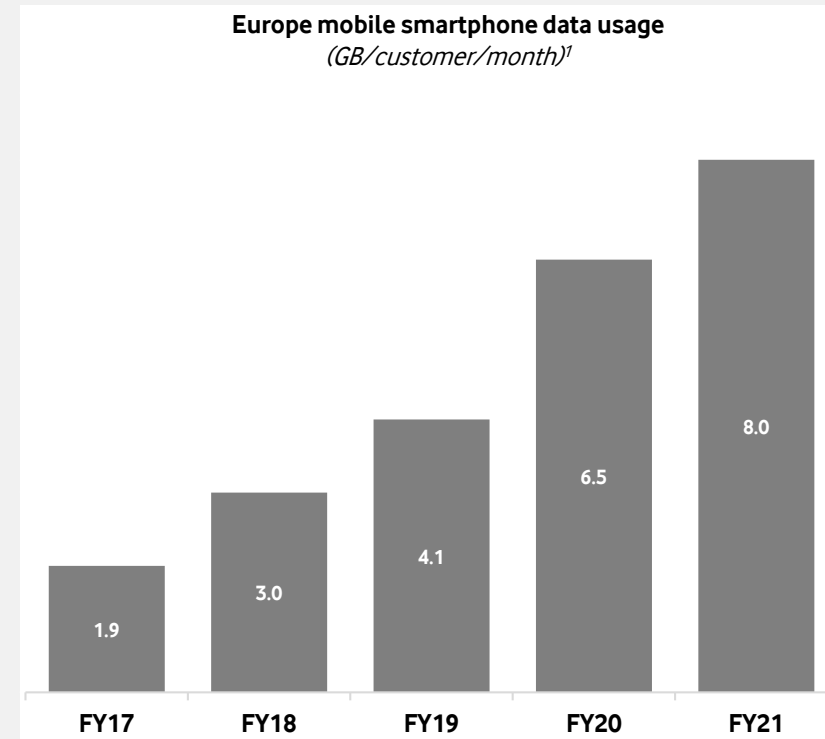
**D** Connectivity and digital payments are shaping demand in Africa

# A: Our customer demand has accelerated over the last year

## Our network data traffic continues to accelerate



## Customer usage is growing rapidly

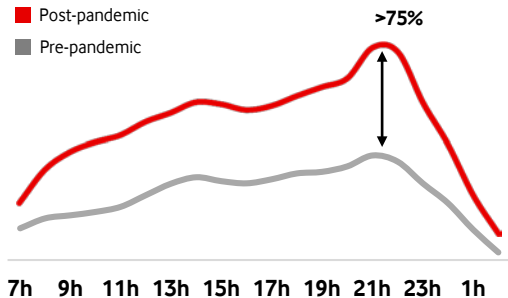


# A: Our customer demand has accelerated over the last year

## Peak demand has increased

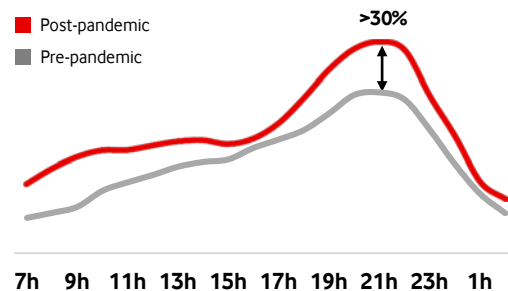
### Mobile data

■ Post-pandemic  
■ Pre-pandemic



### Fixed data – download

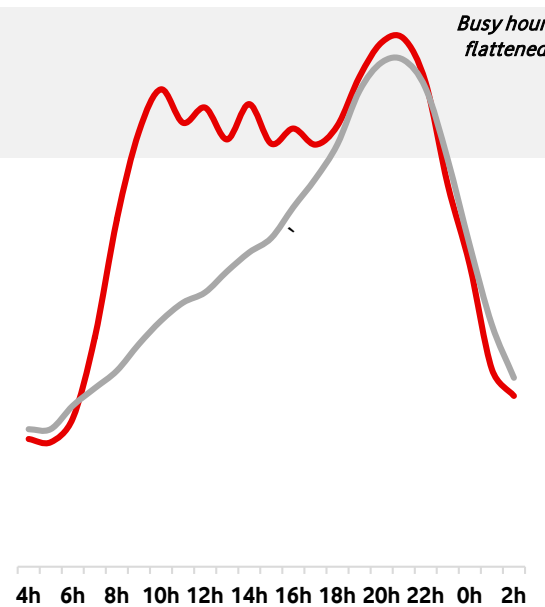
■ Post-pandemic  
■ Pre-pandemic



## Networks are critical for work

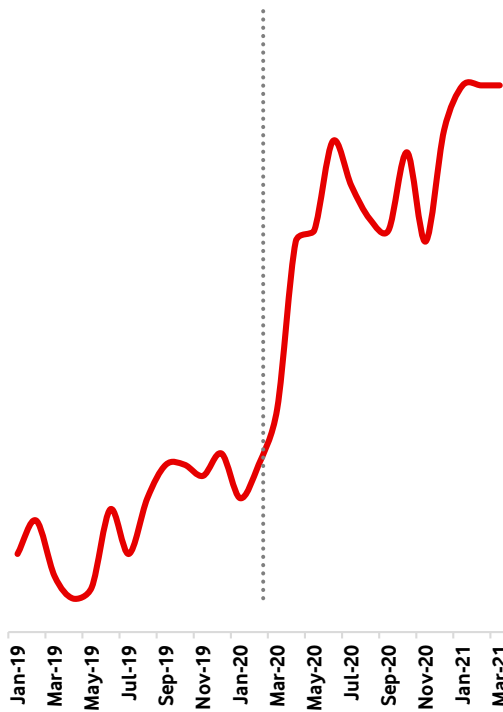
### Fixed data – upload

■ Post-pandemic  
■ Pre-pandemic



## Customers are focused on reliability

### Google searches for “Speed Test”<sup>1</sup>



# B: Cloudification of communication is driving data growth

## Demand drivers

### Consumer

### Business

**4K** 4K video streaming

Enterprise in the cloud

Cloud gaming

Big data/AI analytics

Consumer IoT

Unified communications

Financial services

Low latency services



Download and cloud file storage



Video calling



AR/VR services

## Music streaming operating at scale

### Spotify Monthly Active Users (m)



*1 hour of HiFi quality music: >500 Megabytes of data*

## Video streaming customers ramping up

### Netflix customers in EMEA (m)



*1 hour of 4K video: c.10 Gigabytes of data*

## Cloud gaming



Launched:  
Nov 2019



Launched:  
Feb 2020



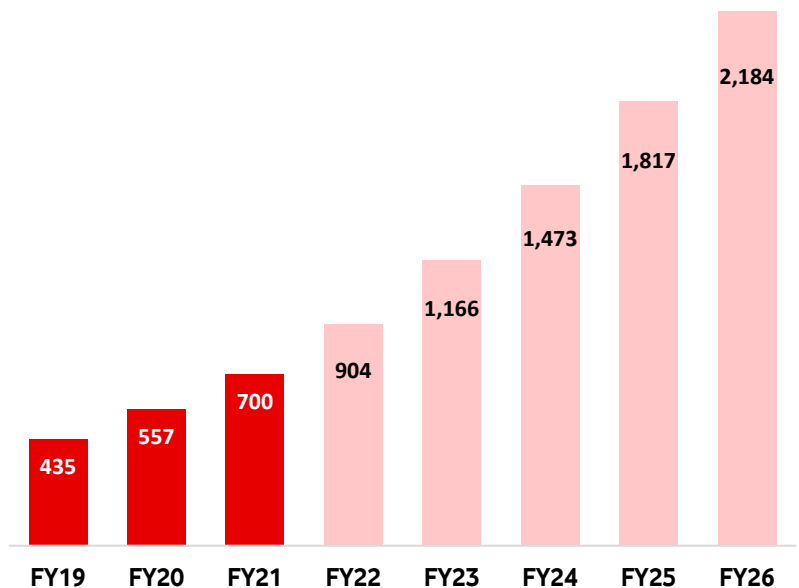
Launched:  
Sep 2020

*1 hour of 4K gaming: c.20 Gigabytes of data*

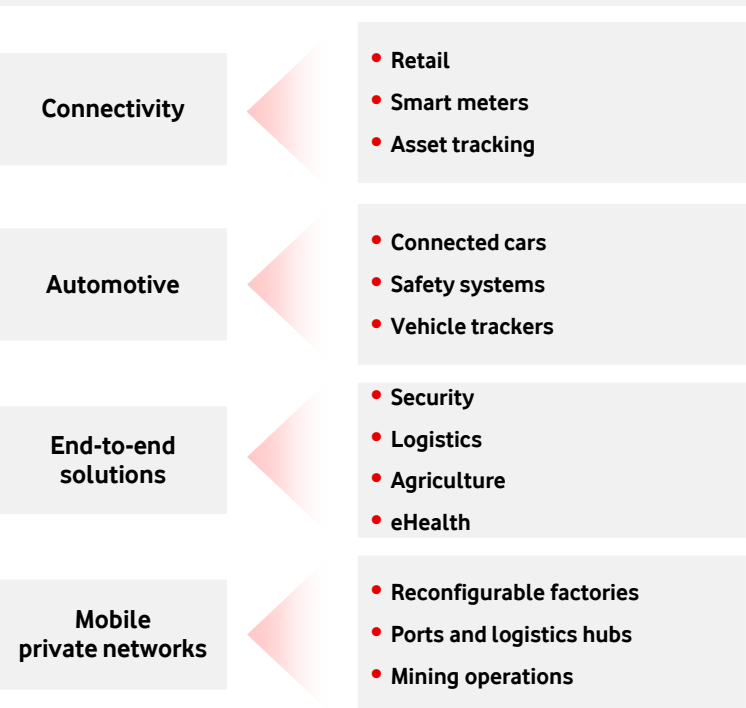
# C: Device and service proliferation will drive further demand

## IoT connections forecast to grow rapidly

IoT SIMs  
(millions, globally excluding China)<sup>1</sup>



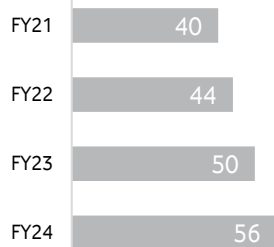
## Driven by expanding scope of business IoT



# C: Device and service proliferation will drive further demand

## Business Cloud - €40bn market; 12% CAGR

### Market size (€bn)

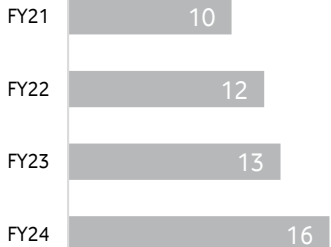


### Growth drivers

- Managed hosting
- SaaS / Managed SaaS
- Multi-cloud
- Edge computing / low latency applications

## Business IoT - €10bn market; 16% CAGR

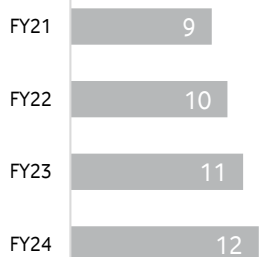
### Market size (€bn)



### Growth drivers

- Industry vertical solutions
- End-to-end solutions
- Mobile private networks

### Market size (€bn)

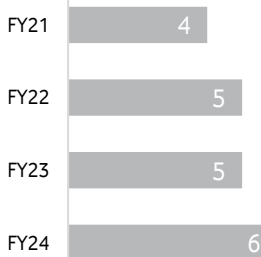


### Growth drivers

- Digital collaboration tools
- Video
- Application integration
- AI-enabled support

## Business Unified Comms - €9bn market; 12% CAGR

### Market size (€bn)



### Growth drivers

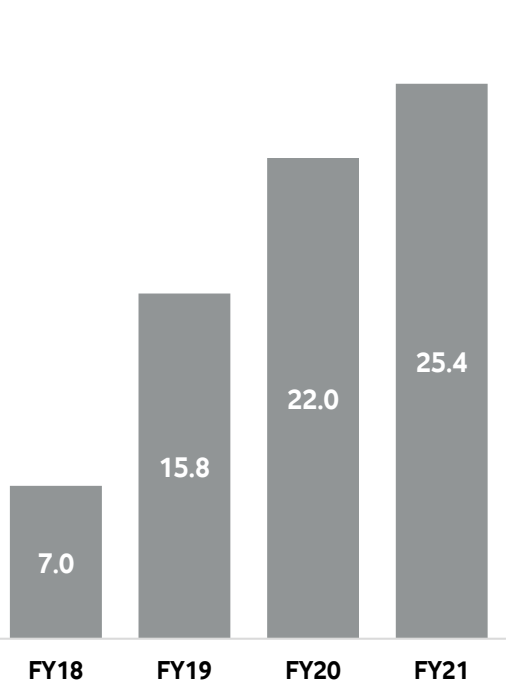
- Network security
- Security SaaS
- Workforce protection
- Managed security services
- Virtual SOC/CISO

## Business Security - €4bn market; 12% CAGR

# D: Connectivity and digital payments are shaping demand in Africa

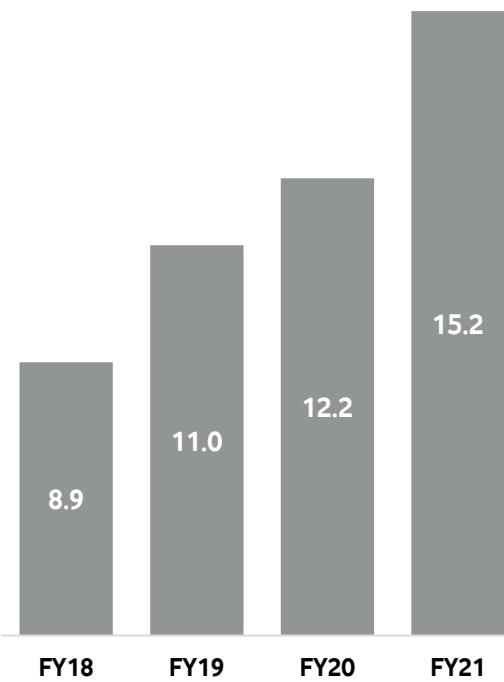
## 4G is still underpenetrated

Africa 4G penetration  
(customer, %)<sup>1</sup>



## M-Pesa volumes are growing rapidly

M-PESA transaction volumes  
(bn)<sup>1</sup>



## Our financial technology roadmap



- **VodaPay smartphone app** to launch in South Africa
- **Full service financial platform**, supported by strong partnerships

### Platforms for both Consumer and Business

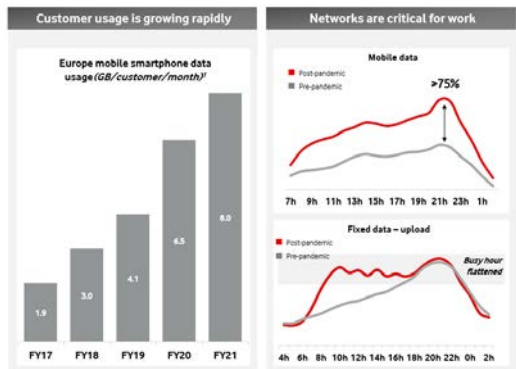
- **M-Pesa mini-apps** expand platform beyond payments
- **New areas** include insurance, loans, savings



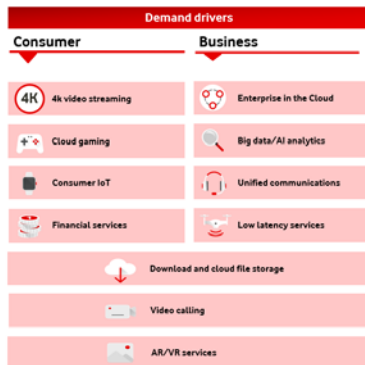


# Summary: Our customer demand continues to accelerate

## 1 Our customer demand has accelerated over the last year



## 2 Cloudification of communication is driving data growth



### B2B Cloud - €40bn market; 12% CAGR



### B2B IoT - €10bn market; 16% CAGR



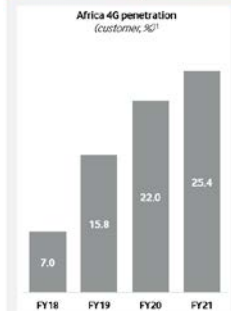
### B2B UC - €9bn market; 12% CAGR



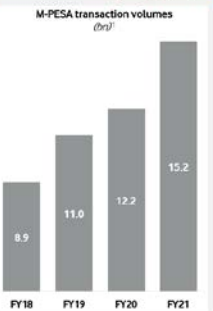
### B2B Security - €4bn market; 12% CAGR



### 4G is still underpenetrated



### M-Pesa volumes are growing rapidly



## 3 Device and service proliferation will drive further demand

## 4 Connectivity and payments are shaping Africa demand

# 2 : We have a strong technology roadmap

**Scott Petty**

*Digital & IT Director*

## Key messages : We have a strong technology roadmap

**A** Providing a leading mobile experience

**B** Delivering gigabit fixed connectivity

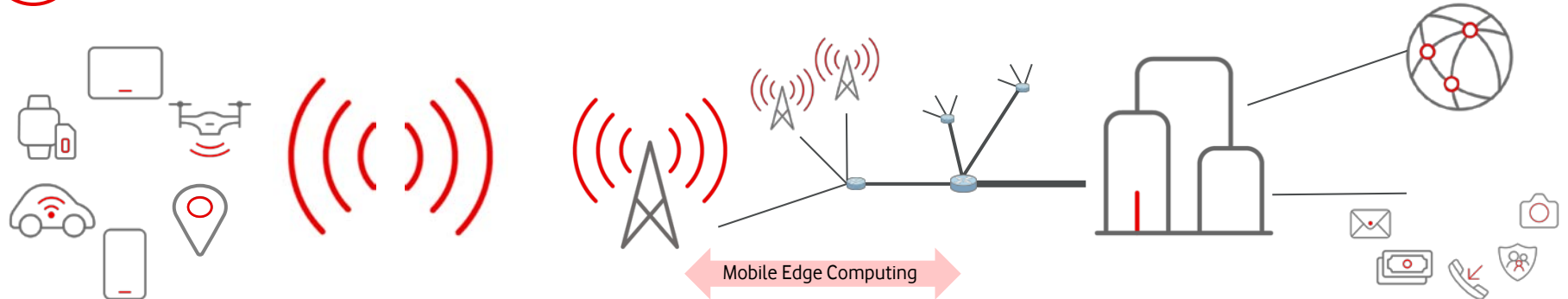
**C** Cloud native digital architecture for radical change

**D** Advanced analytics allow zero-touch intelligent networks

# A: Providing a leading mobile experience



## How our mobile networks work



### Wireless devices

- Devices transmit and receive signals over spectrum to and from radio base stations

>400 million devices

### Spectrum

- The radio frequencies or airwaves over which data is transmitted

c.200MHz of spectrum per market

### Radio base stations

- Transmit and receive signals to and from wireless devices
- Multiple base stations are known as the Radio Access Network (RAN)

169 thousand base station sites

### Backhaul

- Transports data back to and from the core network, typically via a fibre connection

>80% of high-demand nodes with fibre

### Core

- The smart part of the network
- Directs traffic around the network
- Configures the network for different use cases
- Identifies issues

2 pan-European NOCs

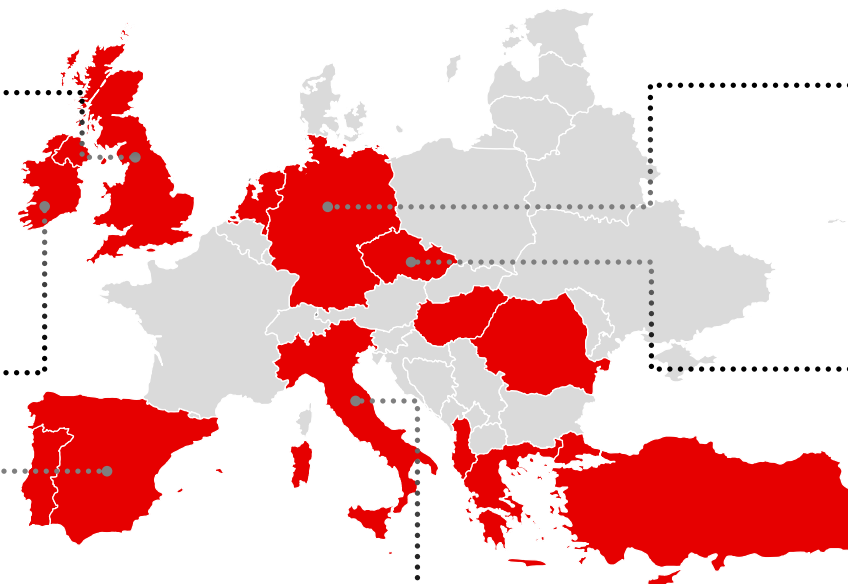
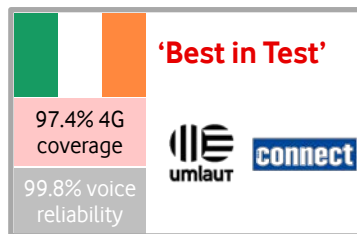
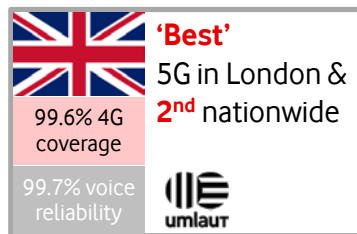
### Services

- The core network provides a gateway to Vodafone services and to third-party services on the wider internet

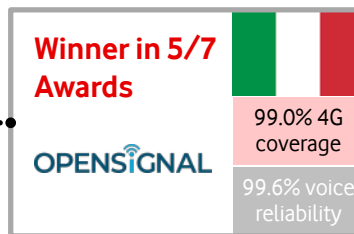
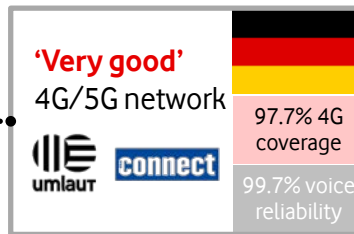
>500 Global Vodafone services

# A: Providing a leading mobile experience

## One of the leading mobile operators in our markets










**5G** 240 5G cities in Europe

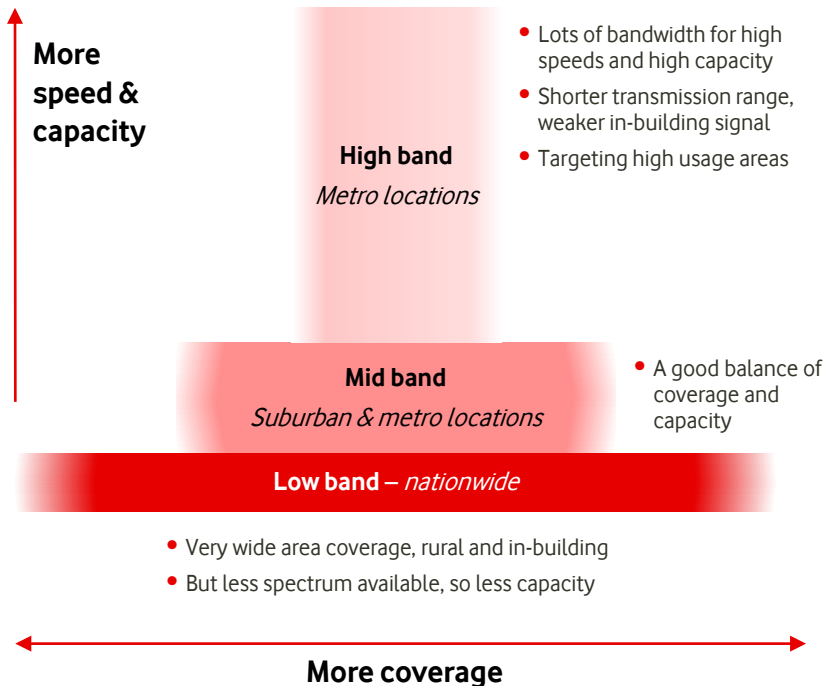


# A: Providing a leading mobile experience

## Strong spectrum holdings<sup>1</sup>

|  | Low | Mid | High | Operators <sup>2</sup> |
|--|-----|-----|------|------------------------|
|  | 35% | 34% | 30%  | 4                      |
|  | 35% | 24% | 25%  | 4                      |
|  | 30% | 20% | 23%  | 4                      |
|  | 31% | 29% | 24%  | 4                      |
|  | 31% | 28% | 30%  | 3                      |
|  | 36% | 39% | N/A  | 3                      |
|  | 37% | 33% | 36%  | 3                      |

## Across all three key bands



# A: Providing a leading mobile experience

## Managing technology evolution effectively

2G

- 'Thin' layer retained
- Legacy voice & IoT support

~~3G~~

- Accelerated phase out
- Spectrum re-farmed for 5G

4G

- Broadest coverage
- Wide handset support in Europe

5G

DSS

- Targeted deployments
- Lighting up additional spectrum

5G

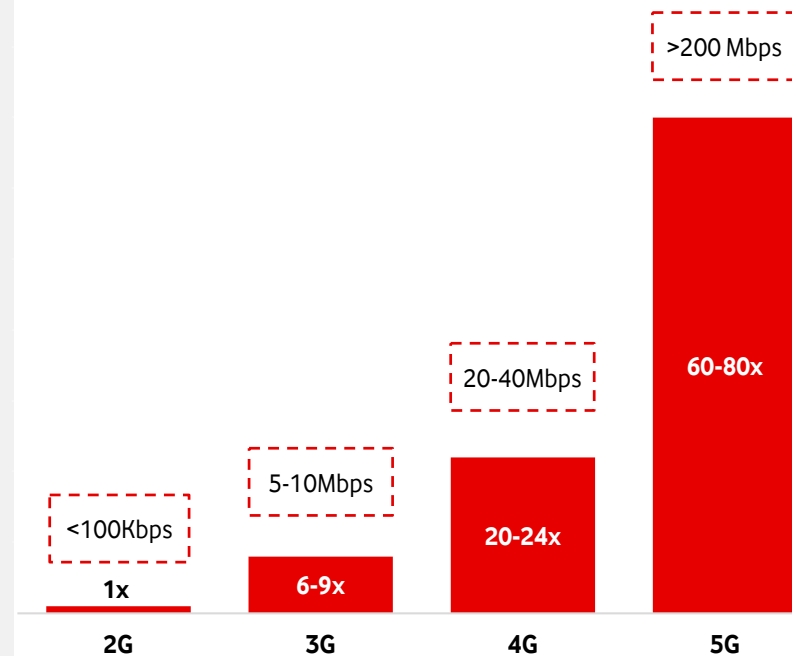
- Focus on 3.5GHz in urban/industrial areas
- Much higher capacity efficiency vs. 4G

## Focusing on more efficient technology

### Spectral efficiency compared to 2G

(multiple)

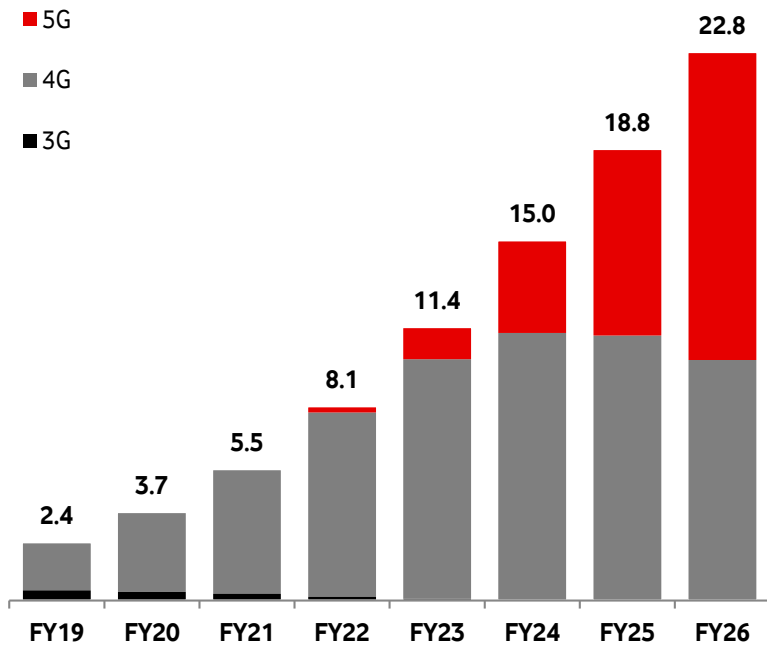
typical realised speed



# A: Providing a leading mobile experience

## Future mobile data traffic growth served by 5G

Total mobile downstream traffic in Germany, UK, Italy and Spain  
(Exabytes per year)



## Supported by Massive MIMO efficiencies



- **Massive MIMO on 3.5GHz** provide higher coverage and capacity, and better spectral efficiency, by spreading many antennas across a single device – e.g. arrays of 64 antennas
- **Signal-to-noise ratio** benefits of Massive MIMO means we can deploy 3.5GHz 5G on the same tower grid as used for 1.8GHz 3G
- **High reliability** and **greater efficiency** with 4-5x lower cost/GB compared to 4G, mainly because of Massive MIMO efficiency gains



# A: Providing a leading mobile experience

## Customer and investor demands

High speed



Low latency



High reliability



Broad coverage



Capex and Opex efficiency



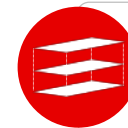
## Delivered through our 5G approach: 'Building it right'



Massive MIMO antennas and **high band spectrum** deliver **10x faster speeds than 4G**



New **5G Core** with network slicing and real-time latency edge computing



**Network slicing** provides dedicated resources to support critical applications



**Low band spectrum** deployed for wide area and deep indoor 5G coverage



**Most efficient network** with **4-5x lower cost/GB** than 4G

# A : Providing a leading mobile experience

## We are a European leader in 5G mobile private networks



- We leverage 5G to help industry digitalise and transform
- We provide significantly scaled private and secure IoT, with high speed, low latency, and high reliability enabling thousands of connections in a single site
- We open up new opportunities for autonomous digital operations in areas such as ports, mining operations, and reconfigurable factory production lines

## Mobile private network key benefits



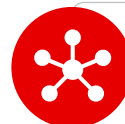
**5G standalone core** enabling network slicing and high efficiency



**Real-time end-to-end latency** built in



**Secure private connectivity** for critical systems and processes



**Scaled private IoT** capability with high reliability and full local control

# A: Providing a leading mobile experience

## We have established new network sharing models

Passive sharing only

### Active sharing

(Active sharing outside biggest cities + passive everywhere else)

**Target model**

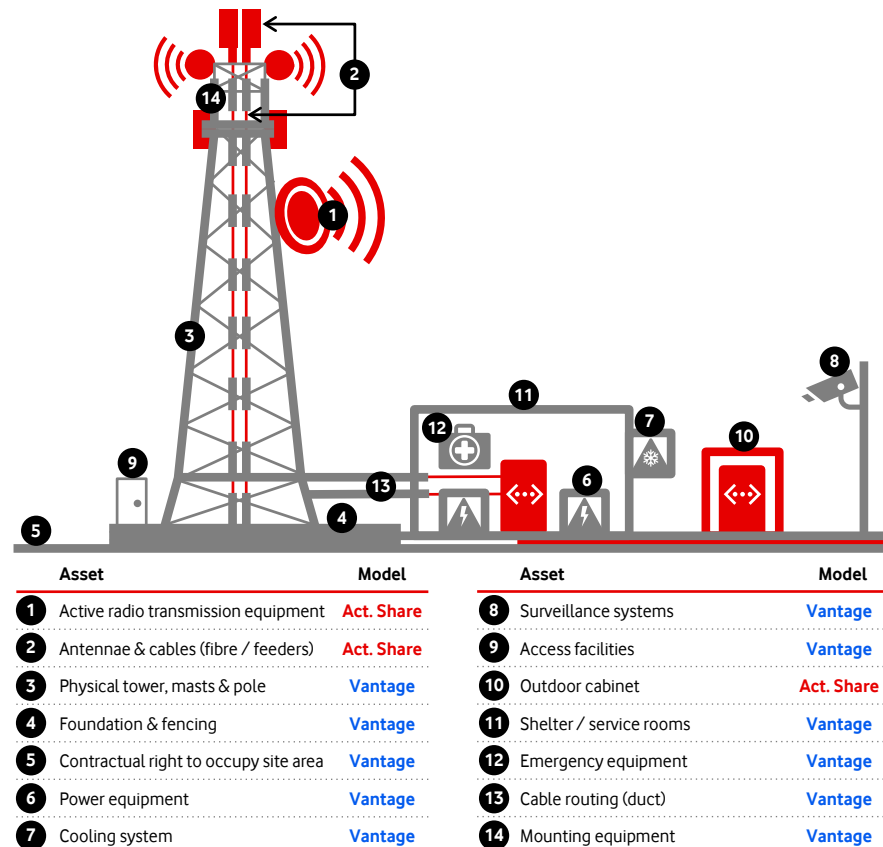
National active sharing

Full sharing  
(inc. spectrum)

- Improving asset utilisation by sharing our Radio Access Network infrastructure, whilst improving rural coverage
- No active sharing in major cities where capacity is key

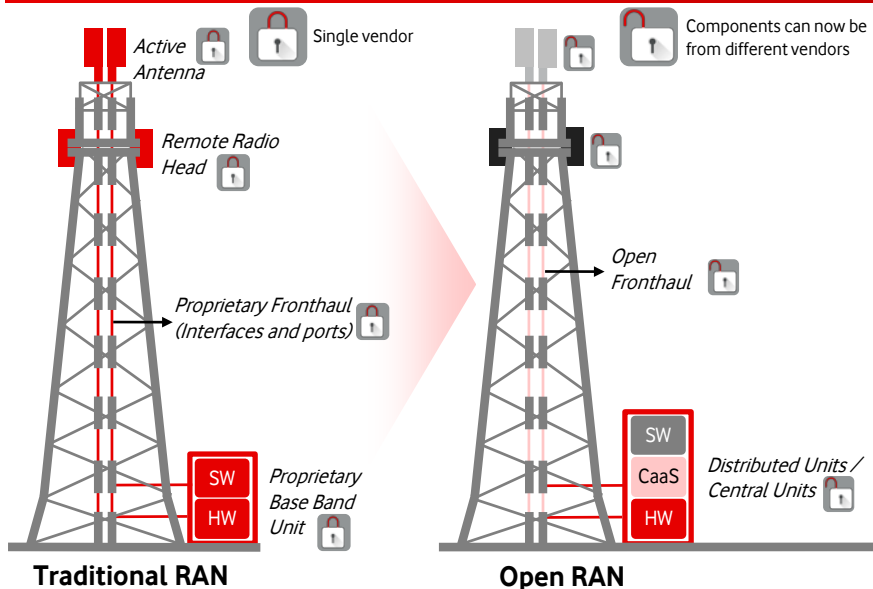
## Vantage Towers

- 82,200 sites across Europe
- Improves asset utilisation through increasing the number of operators with active equipment on our towers in exchange for a fee





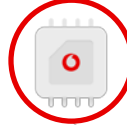

# A : Providing a leading mobile experience

## We are a founding partner of Open RAN



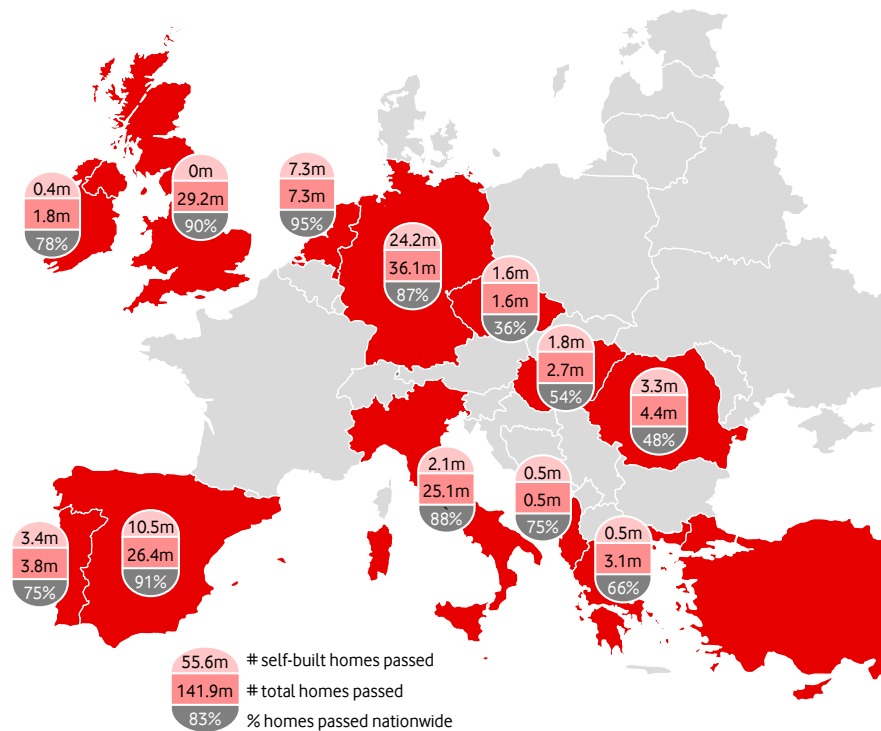
- Traditional vendor hardware (HW) and software (SW) is integrated; with no inter-operability with other vendors within the same RAN
- Open RAN separates hardware and software through a Container as a Service (CaaS) layer, and provides open interfaces between all key network elements. This enables third-party software to be embedded

## Open RAN benefits

- 
**Significantly grows vendor pool** by lowering entry barriers for specialised software developers
- 
**Platform for innovation** with significantly accelerated development and specialisation
- 
**General purpose hardware** processing platforms increase flexibility and reduce costs
- 
**Flexible networks** with ability to upgrade and swap out individual components with ease

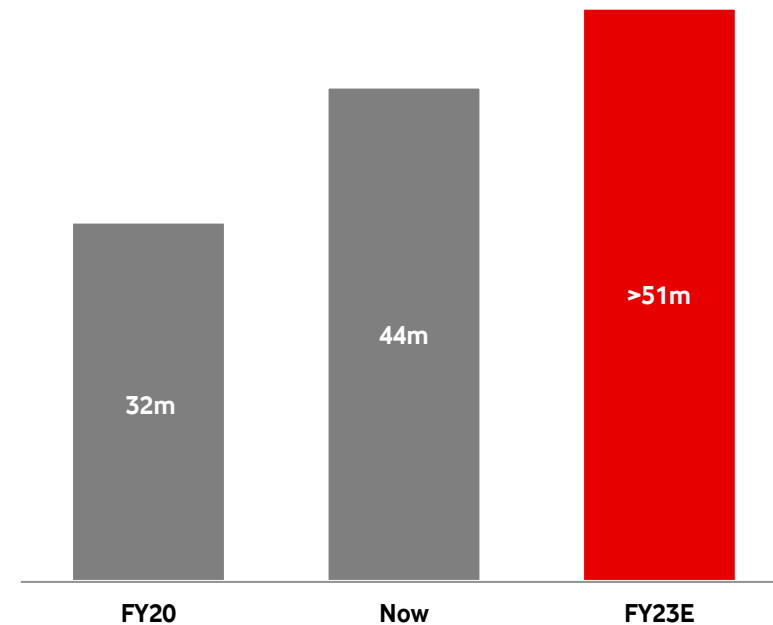
## B: Delivering gigabit fixed connectivity

Over 140m NGN homes passed<sup>1</sup>



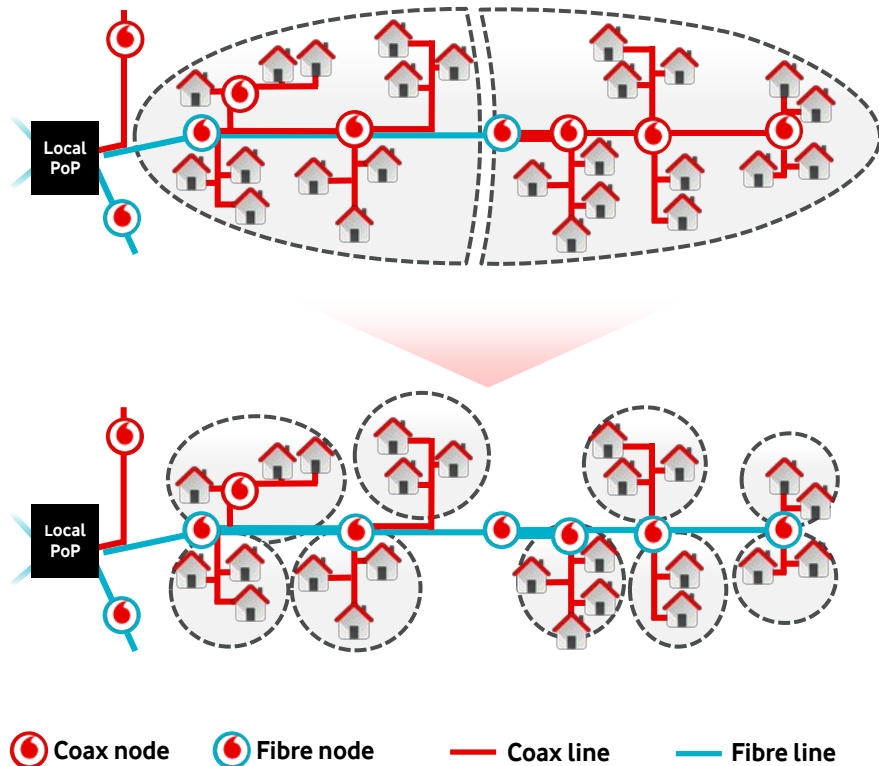
Rapid upgrade to gigabit speeds

Self-built homes passed with gigabit speeds<sup>1</sup>



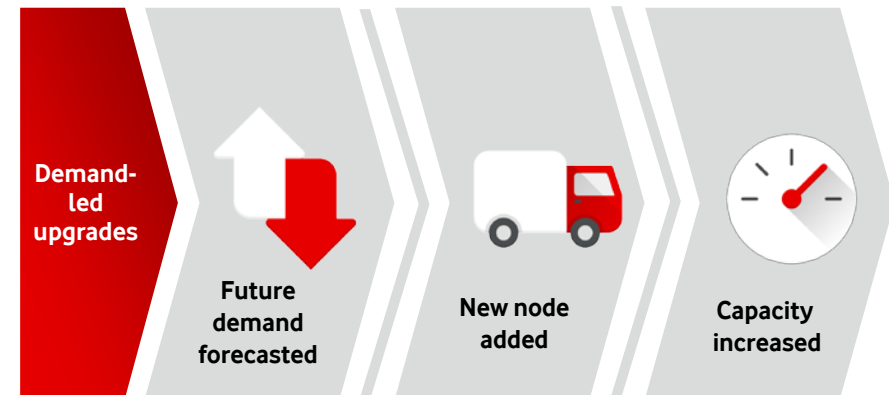
## B: Delivering gigabit fixed connectivity

### Building fibre deeper into our hybrid fibre cable network



### A demand driven fibre upgrade path




- Fibre nodes deployed close to the customer
- High bandwidth coaxial cable used to connect the building to the node



Avoids rewiring customer homes, saving cost and customer disruption

## B: Delivering gigabit fixed connectivity

### A clear roadmap beyond 1 Gbps peak speeds

|                  | Completion   | Downstream speed | Upstream speed |               |
|------------------|--|------------------|----------------|---------------|
| DOCSIS 3.0       |  100% | 500Mbps          | 50 Mbps        | Product speed |
| DOCSIS 3.1       |  >80% | 1.8Gbps          | 100Mbps        |               |
| 'High-split' 3.1 |  <5%  | >3Gbps           | Up to 1Gbps    | Network speed |
| DOCSIS 4.0       | Test & validate  | Up to 10Gbps     | 2 to 4 Gbps    |               |

### A strong upgrade path for our hybrid fibre cable network



DOCSIS 3.1 enables 1.8Gbps downstream speeds today



'High-split' DOCSIS 3.1 allows upstream network speeds up to 1Gbps by reallocating cable spectrum



Distributed cable architecture allows digital transmission, improving signal quality

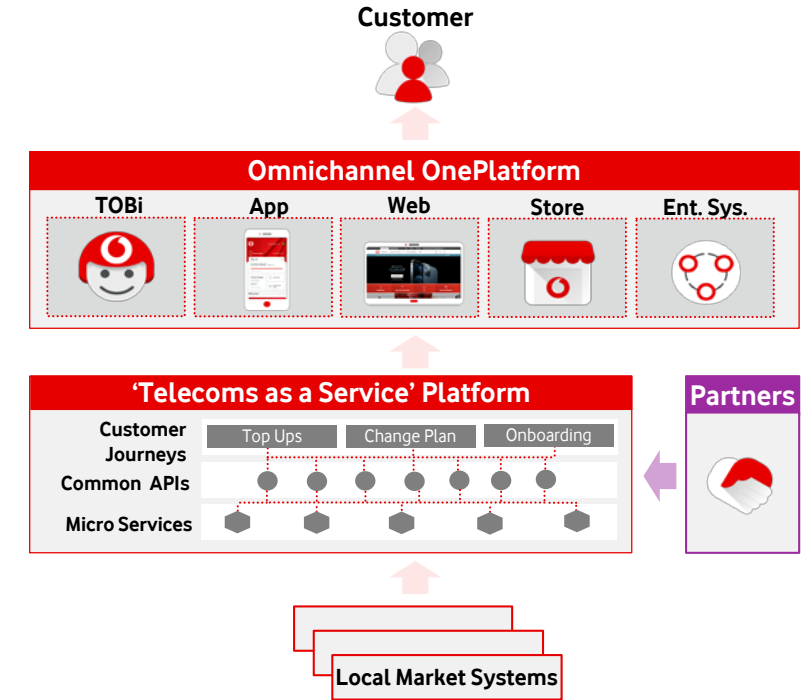
- DOCSIS 4.0 standard released in 2020
- Speeds up to 10Gbps
- Testing expected to begin from next year

# C: Cloud native digital architecture for radical change

## Legacy approach to architecture



## Tech2025 approach to architecture



Develop once, redeploy everywhere – Enabling efficiency and speed



# C : Cloud native digital architecture for radical change



## Scalability

- Moved from single-market servers to shared systems on the cloud

Ability to rapidly scale up to meet Consumer and Business demand

TOBi standardised across 11 markets



## Open-source interfaces

- IT and Networks turned into platforms via open-source interfaces

Easier access for third parties, enabling new revenue generating opportunities

57% of IT applications virtualised



## Single Data Ocean

- All Vodafone data moved to one central repository on the cloud

Larger datasets enable improved AI-based decisions

17 Petabytes of shared data, enabling >150 AI projects



## Agile development

- Development moving from project to product based
- Developers embedded within commercial teams

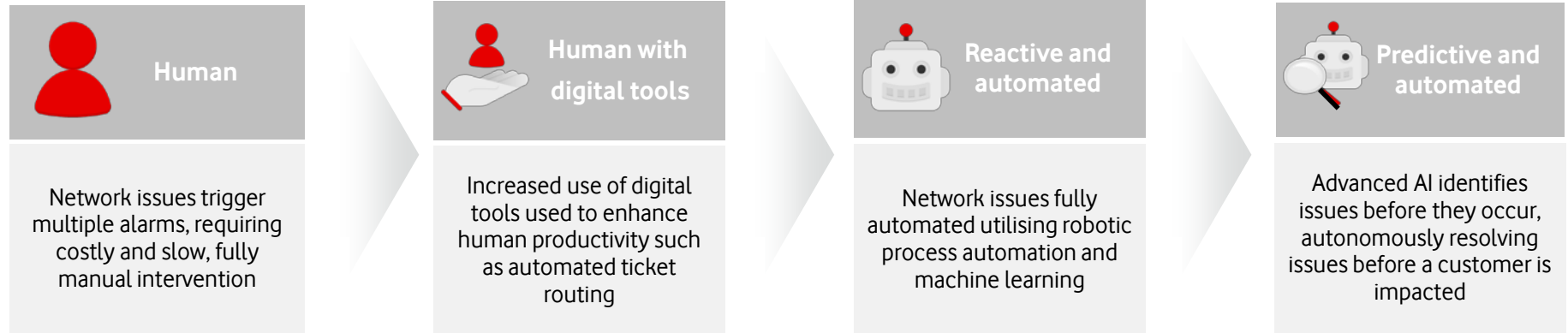
Products continuously improved whilst in use

Legacy IT systems upgraded to digital experience layers in 17 markets

Enabling efficiency and speed

# D: Advanced analytics allow zero-touch intelligent networks

## Automate manual human processes



## Driving efficiency, speed & reliability

35% of network tickets automated in 7 markets

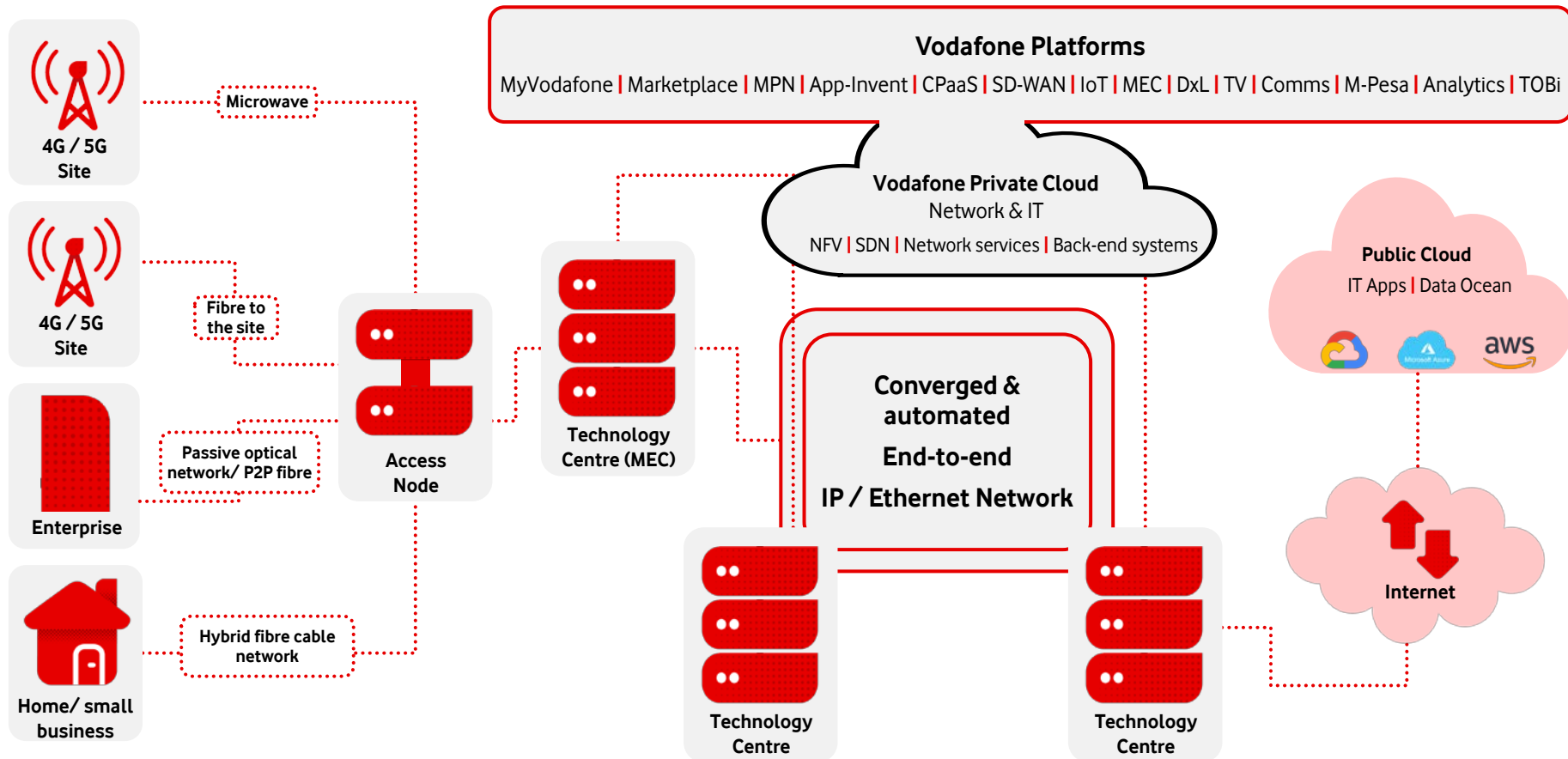
90% improvement in speed to dispatch over the last year in 4 markets

12m operational activities automated a year

80% of Monitoring and Diagnostics automated across 7 markets

99.8% Mobile Availability in Europe

# Summary : We have a strong technology roadmap



# 3 : We allocate capital to drive returns

**John Otty**

*Group Financial Controller*

## Key messages : We allocate capital to drive returns

**A** Investing efficiently in connectivity infrastructure

**B** Allocating capital to drive returns and growth

**C** Relentless focus on efficiency and simplification

**D** Investing in digital opportunities with attractive returns

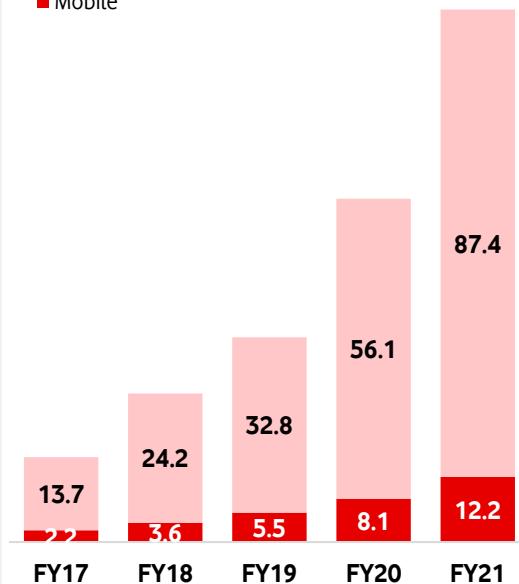
# A: Investing efficiently in connectivity infrastructure

## Usage has grown rapidly

### Network traffic

(Exabytes per year)<sup>1</sup>

- Fixed
- Mobile



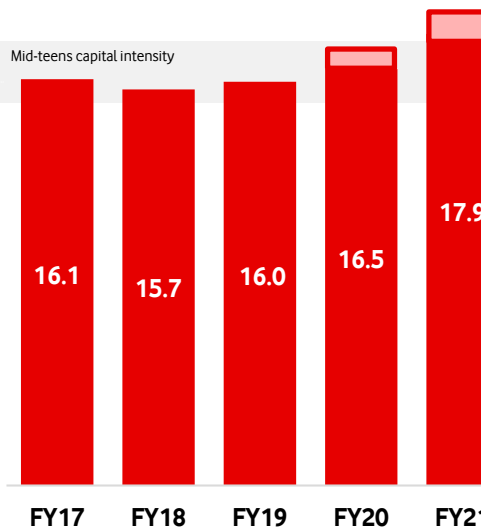
## Capital intensity has absorbed this

### Capital intensity

(%)

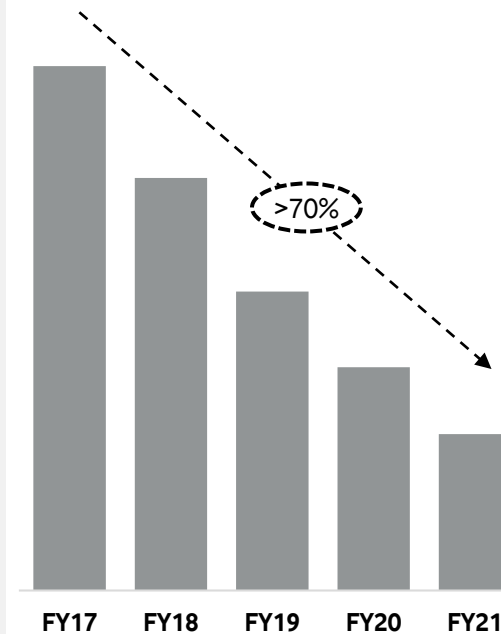
- Includes impact from acquired Liberty Global assets and IFRS15

Mid-teens capital intensity



## As Cost per GB has fallen faster

### Cost per GB

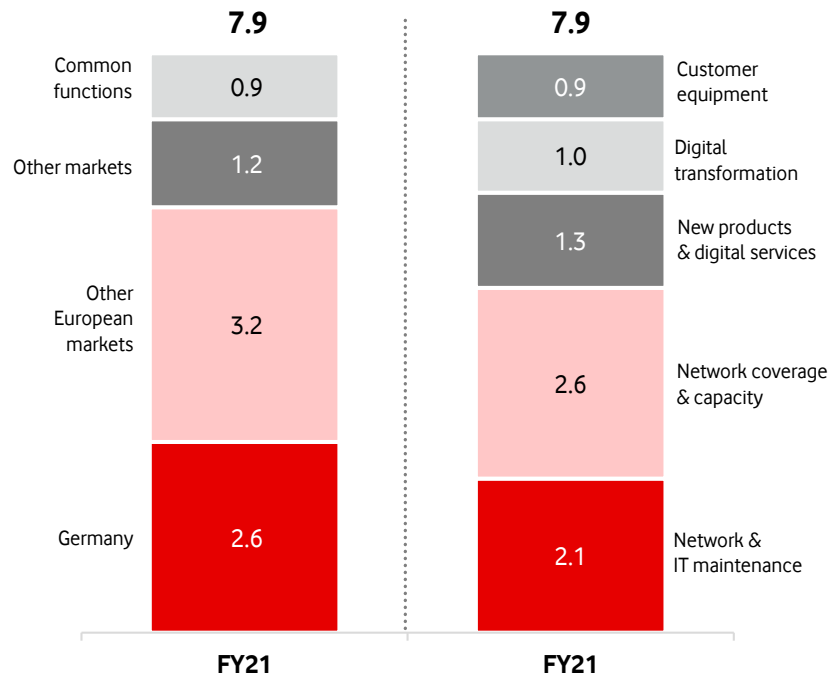


# A : Investing efficiently in connectivity infrastructure

## Capital allocation breakdown

### Capital additions

(€ billions)



### Customer equipment

- Investments into owned equipment that is used to service customers

### Digital transformation

- Large IT projects that will reduce costs and improve organisational agility

### New products and digital services

- Investments into new revenue generating products and services across Consumer and Business

### Network coverage and capacity

- Investment to build new coverage, typically in rural areas, or to add new technology coverage, e.g. 5G

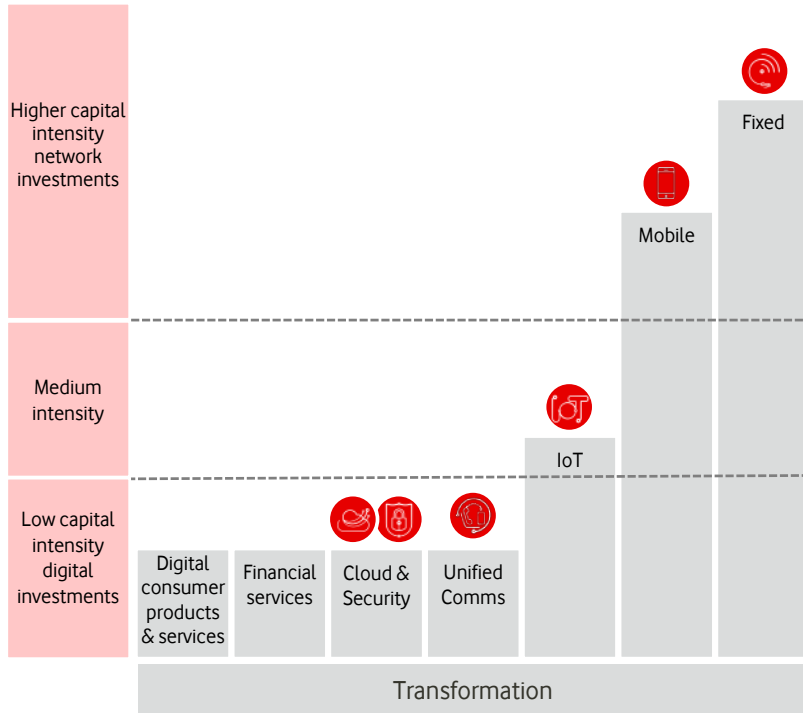
### Network & IT maintenance

- General maintenance costs incurred to ensure the running of our Network & IT assets

# A : Investing efficiently in connectivity infrastructure

## Capital intensity varies across our segments

### Illustrative capital intensity



## Investing and partnering



**Hybrid fibre cable** markets typically have higher capital intensity due to node-splits and customer equipment



**Mobile investment** typical investment around 'low-teens' capital intensity



**IoT and private networks** developed by Vodafone

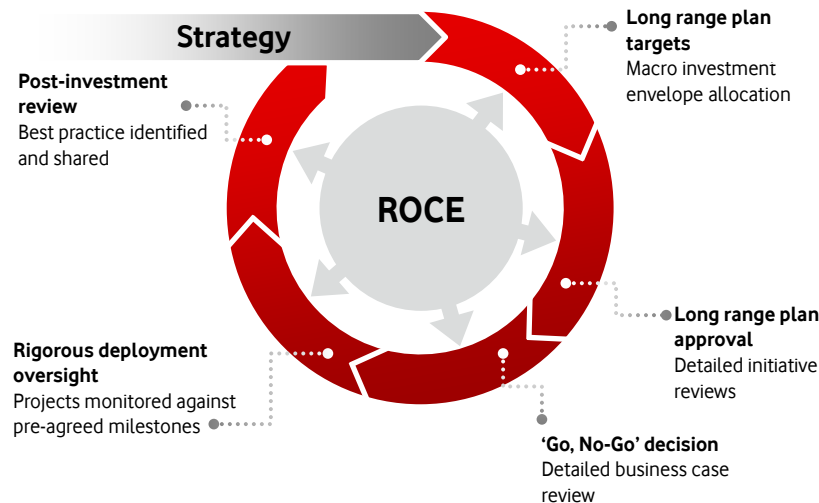


**Partnership model** with global technology leaders in Cloud & Security, UC, Financial Services and Digital Consumer Products

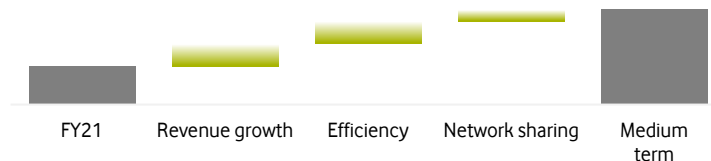


# B: Allocating capital to drive returns and growth

## Capital allocation review process built around ROCE



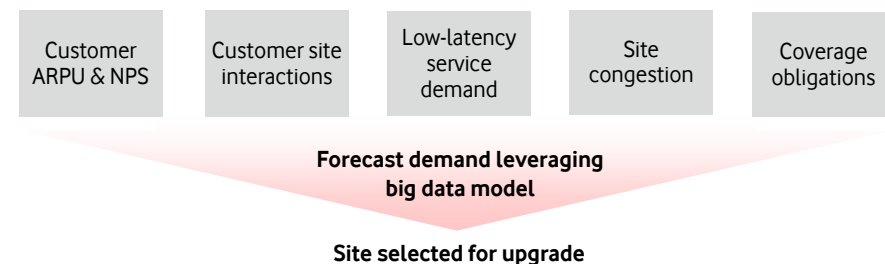
## Illustrative ROCE growth bridge



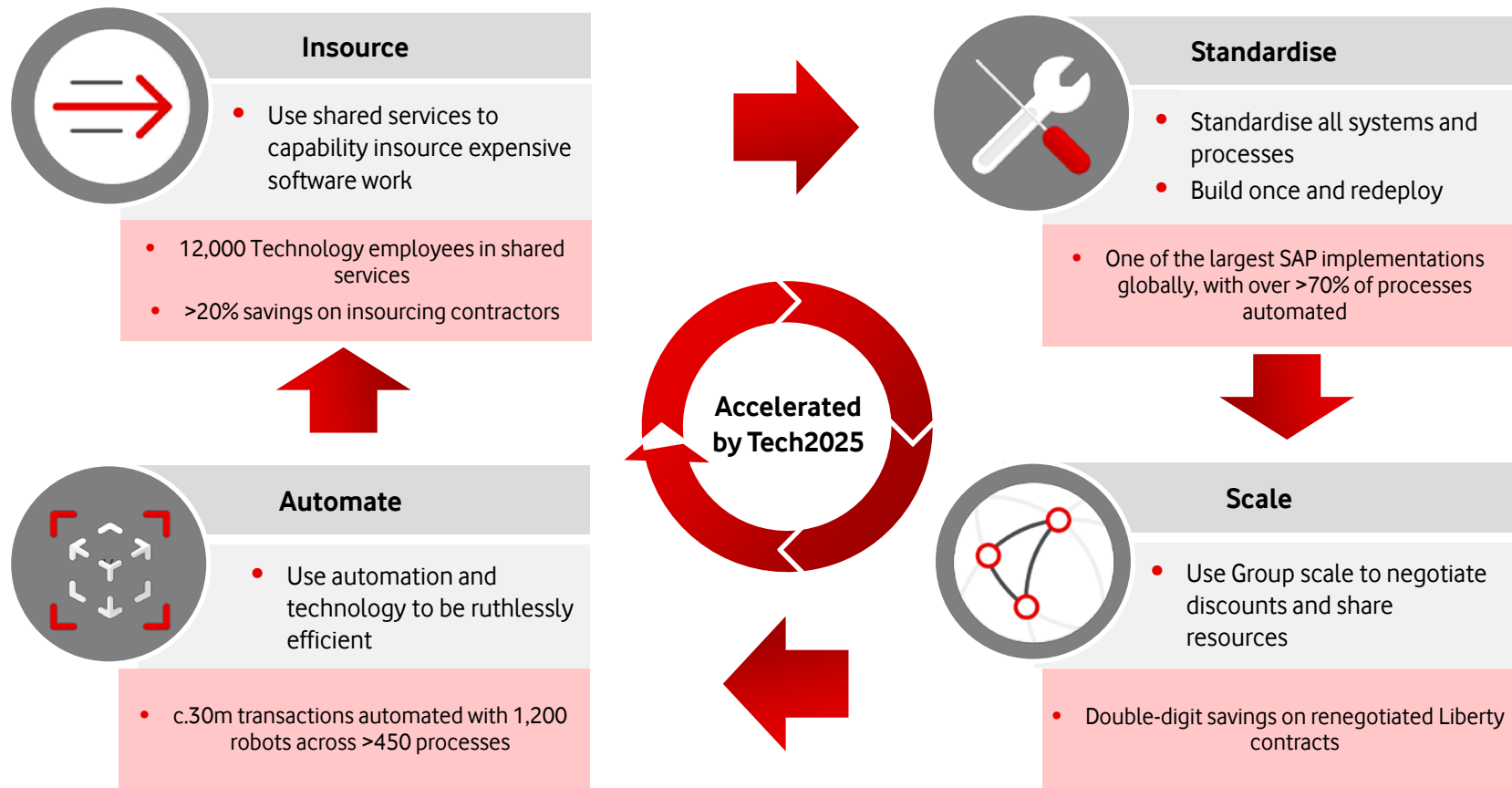
## Capital allocation framework

|  | Capex (€bn) | Allocation criteria                                  | Decision metrics                        |
|--|-------------|--|---|
| <b>Customer equipment</b>                  | 0.9         | Unitary cost optimisation<br>Revenue                 | Customer lifetime value                 |
| <b>Digital transformation</b>              | 1.0         | CRM tech cycle<br>Network lifecycle                  | < 8 years payback /<br>Double digit IRR |
| <b>New products &amp; digital services</b> | 1.3         | Business case driven                                 | 2-4 years payback /<br>20%+ IRR         |
| <b>Network coverage &amp; capacity</b>     | 2.6         | Business case, competitive positioning & obligations | EM: <3 year payback<br>EU: Smart Capex  |
| <b>Network &amp; IT maintenance</b>        | 2.1         | Efficiency benchmarks<br>Lifecycle management        | Supply chain optimisation               |

## Network site investment - smart capex model



# C : Relentless focus on efficiency and simplification

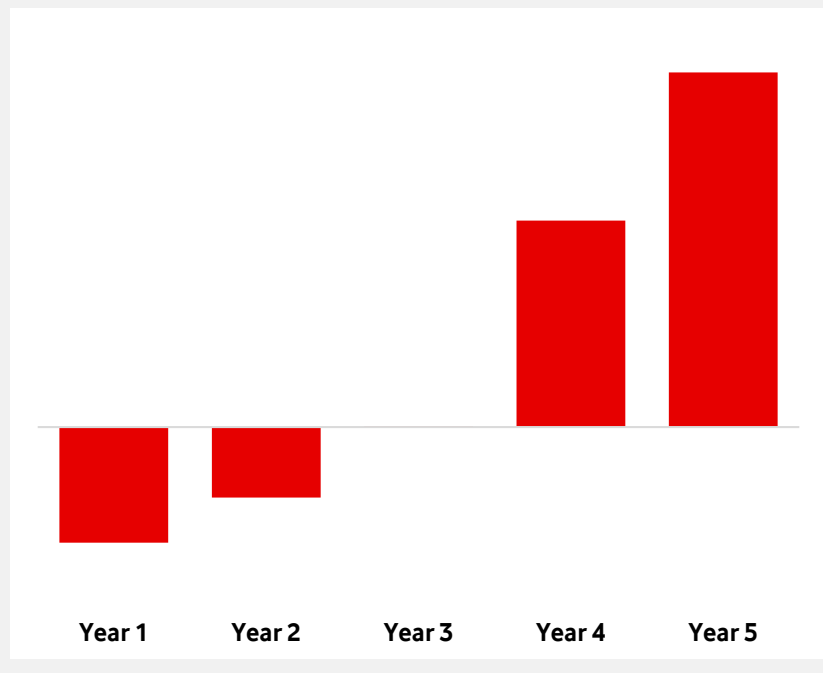


# C: Relentless focus on efficiency and simplification

## Agreed network sharing across Europe

| Country  | Partner                          | Latest update | Sharing status  |
|----------|----------------------------------|---------------|---|
| Germany  | Deutsche Telekom & Telefonica DE | Nov'2019      | Passive sharing with DT & TEF in 5k 'white spots' + active sharing in 3k 'grey spots' |
| Italy    | Telecom Italia                   | Feb'2019      | 4G & 5G active + passive sharing + backhaul   |
| UK       | O2                               | Jul'2019      | 4G & 5G active + JV for passive infrastructure  |
| UK       | EE, O2, 3                        | Mar'2020      | Shared rural network for 4G active sharing  |
| Spain    | Orange                           | Apr'2019      | 4G & 5G active + passive sharing  |
| Greece   | Wind                             | Jul'2019      | Active sharing + JV for passive infrastructure  |
| Romania  | Orange                           | Dec'2018      | 4G active + passive sharing   |
| Portugal | NOS                              | Oct'2020      | Active + passive sharing  |

## Illustrative phasing of FCF benefits from network sharing



**Reduces future network investment burden by c.€2.5 billion\***

# C: Relentless focus on efficiency and simplification

## Key examples



IBM Cloud partnership  
2019

Co-develop new digital solutions,  
access to IBM multicloud and reduced  
capital requirements



Vantage Towers  
2021

Increased focus on operational  
efficiency whilst generating revenues

3G

Shutdown 3G in Europe  
2020 - 2023

Italy, NL and CZ already shutdown.  
Total European shutdown will free up  
c.20 MHz of spectrum per market



OpenRAN ready to be  
deployed at scale  
2023

Increased supplier diversity

**Tech**  
2025

Increased operational efficiency  
and organisational agility

## Vodafone global data ocean partnership with Google



Common data  
sourcing



Common data  
platform



Common data  
model



Common data  
products

## Data at the Core



Unified data  
ownership and  
governance

50% cost reduction in data  
storage



Single view of  
business  
performance

Over 90% reduction in  
manual efforts for  
business performance  
reviews



Meet all future  
regulations

30% reduction in cost for  
meeting regulatory  
requirements



In-house skill  
development

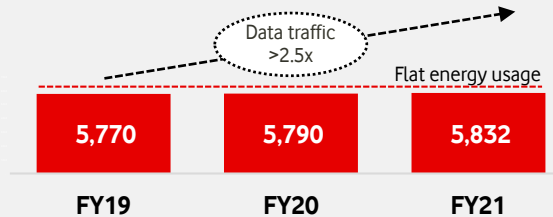
75% reduction in cost of  
data engineering

# C: Relentless focus on efficiency and simplification



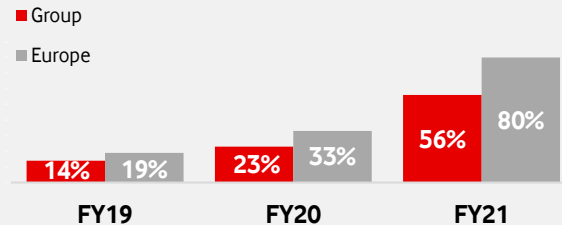
## Flat energy consumption despite increasing demand

*Energy use vs. network traffic  
(GWh vs Exabytes)*

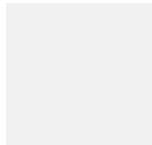


## Accelerating our use of renewable electricity

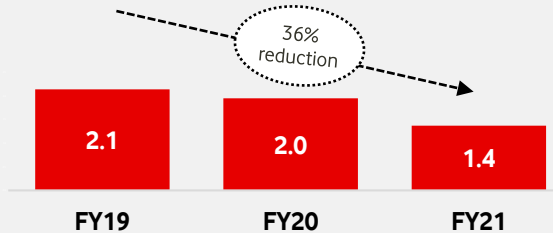
*Renewable electricity as share of purchased electricity  
(%)*



Reducing our  
environmental  
impact

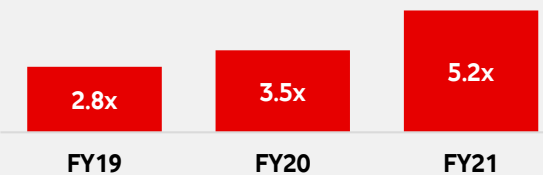


*Scope 1 & 2 greenhouse gas emissions  
(million tonnes CO2e)*



Reducing our impact on the planet

*Customers' avoided tonnes CO2e vs. our own operations*



Helping our customers reduce their own emissions



# D: Investing in digital opportunities with attractive returns

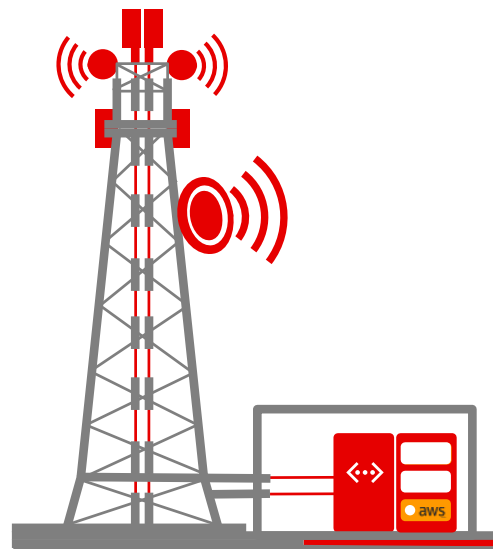


## Distributed Multi-access Edge Computing

### Overview



- Integrating AWS computing servers at the edge of the network, enabling real-time latency
- First to market with AWS in Europe
- Attractive partner given pan-European scale and increasingly standardised IT and Network stacks
- Capital investment of around €10-30m per year over the medium-term
- High return as it leverages existing assets and customer relationships



## Customers



**>180** companies in the pipeline



**10** pilots completed, 10 in progress



**6** sectors expressed interest: Automotive, Manufacturing, Entertainment, Technology, Retail and Public services



## Customer use case



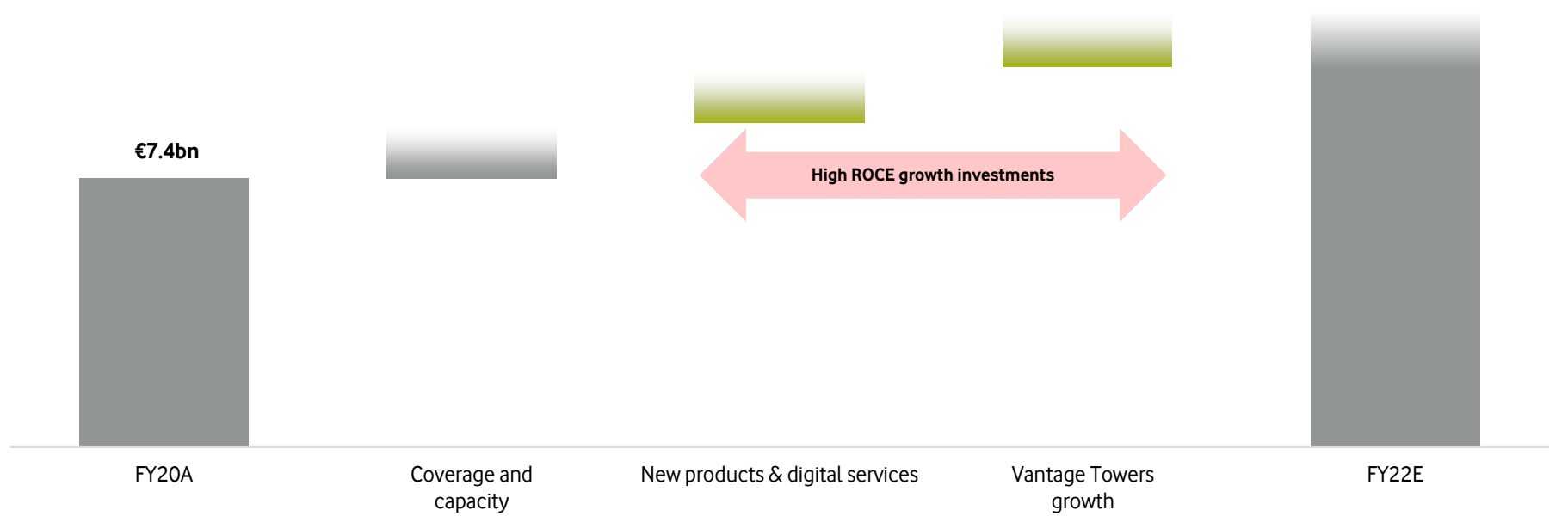
### Dedrone®

- Dedrone protects key sites such as ports, factories and powerplants against unwanted drone activity, requiring rapid response times
- Dedrone's counter-drone platform has, therefore, been integrated into Vodafone's Multi-access Edge Computing solution



# D : Investing in digital opportunities with attractive returns

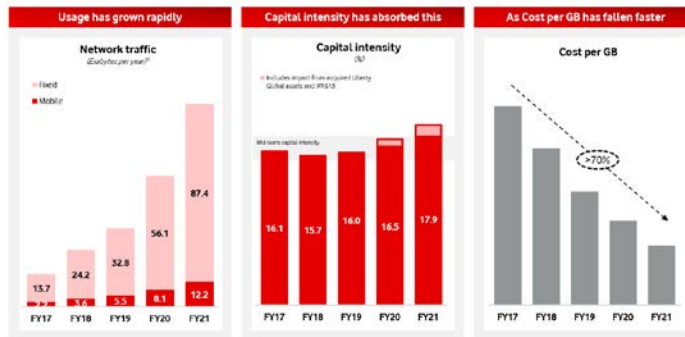
## Pre-pandemic to post-pandemic capex elements



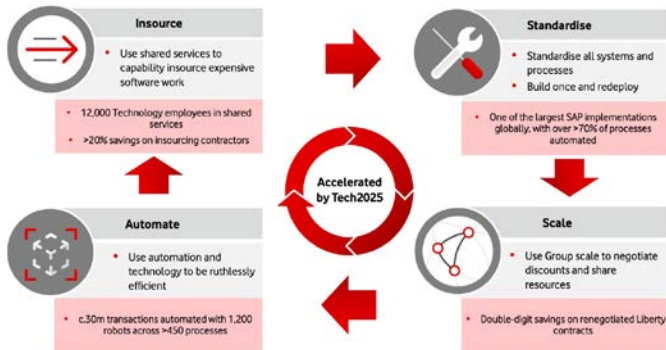
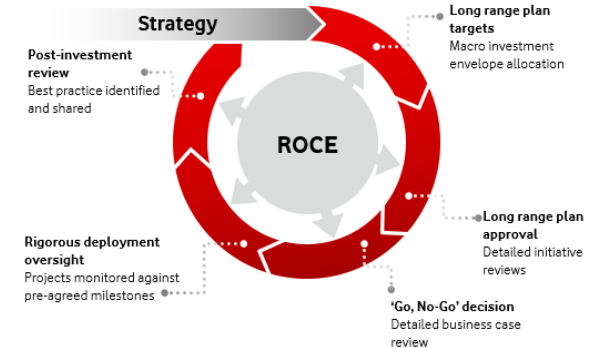
**Investing in new Vodafone products and services & Vantage Towers growth at good incremental ROCE**

# Summary: We allocate capital to drive returns

## 1 Investing efficiently in connectivity infrastructure

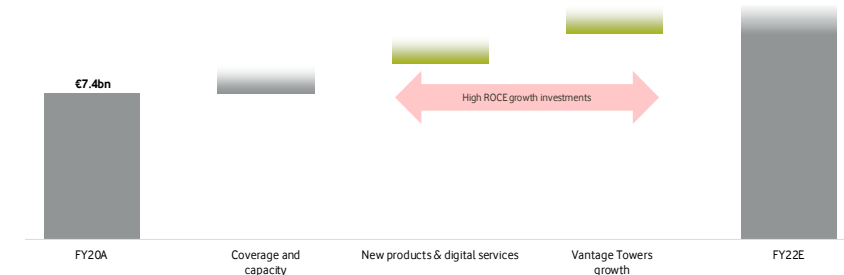


## 2 Allocating capital to drive returns and growth



## 3 Relentless focus on efficiency and simplification

## 4 Investing in digital with attractive returns





# 4 : We are transforming to deliver growth

**Johan Wibergh**  
*Chief Technology Officer*



## Key messages : We are transforming to deliver growth

A

**We have transformed our operating model**

B

**We have the right team and capabilities to deliver**

C

**We have a clear vision to drive growth**

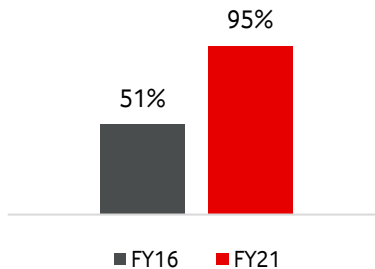
D

**We are enabling new digital products and services**

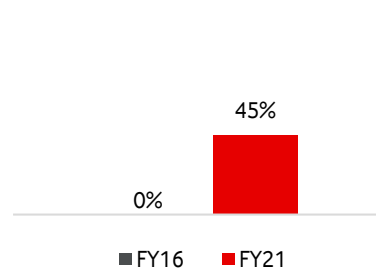
# A: We have transformed our operating model

## Network efficiency

EU 4G/5G data traffic (%)

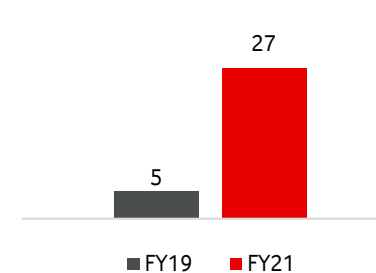


EU VoLTE voice traffic (%)

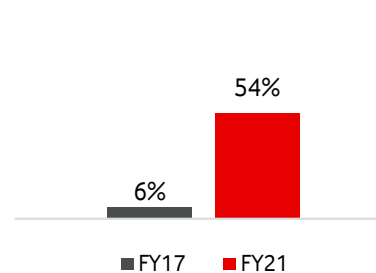


## Digitalisation

TOBi monthly conversations (m)

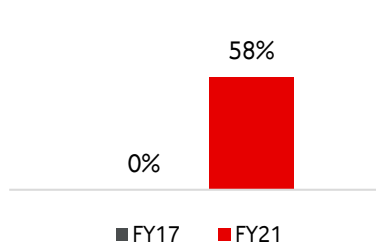


Agile IT delivery spend (%)

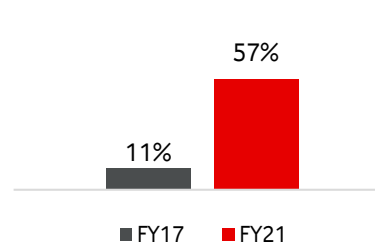


## Cloudification

Network functions (%)

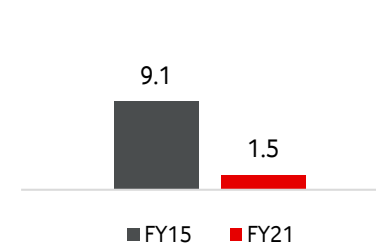


IT applications (%)

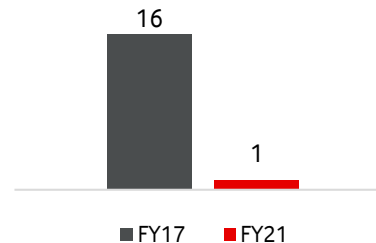


## Network resiliency

EU networks major incidents (#/month)



Int'l network major incidents (#/year)



# A: We have transformed our operating model

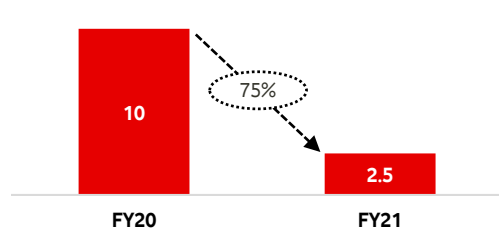
## Significant improvements in digital channel delivery in the UK

### Planning

- We continue to drive and embed Agile methodology throughout the organisation
- The average time spent planning an agile project phase, known as a sprint, has reduced by 75% over the last year

#### Massive improvement in planning speed

Number of days to plan an Agile sprint in the UK

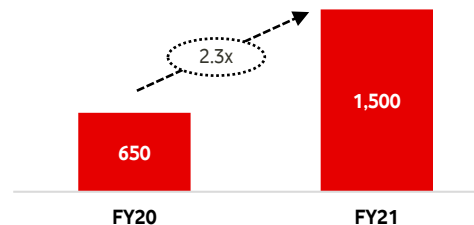


### Efficiency

- Agile has enabled improved efficiency, driving faster product launches across Consumer and Business
- The average speed to deliver one unit of work in the UK has improved by >35% YoY to 8.5 days

#### Massive increase in the number of software releases

Annual Digital software releases in the UK

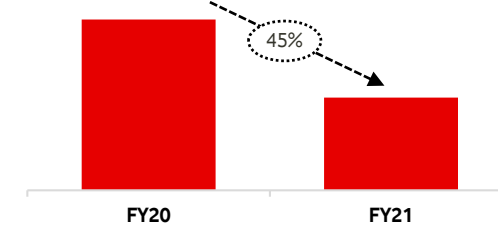


### Effectiveness

- Despite the increasing amount of software releases we are continuing to reduce errors and drive higher quality
- Our internal software tests show a 30% improvement in quality YoY

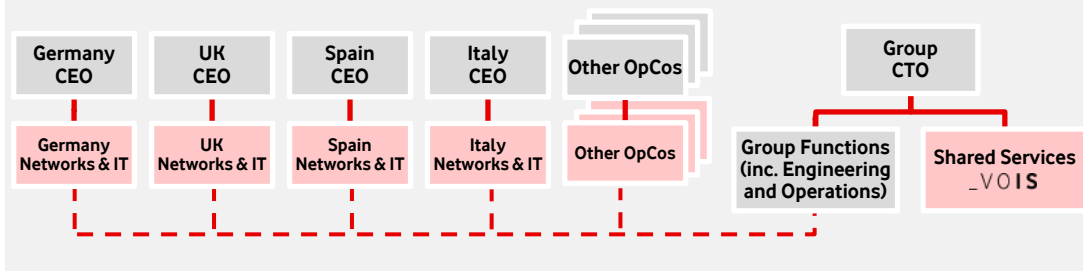
#### Release defects continue to decrease

Release defect rate in the UK



# A : We have transformed our operating model

## Legacy operating model

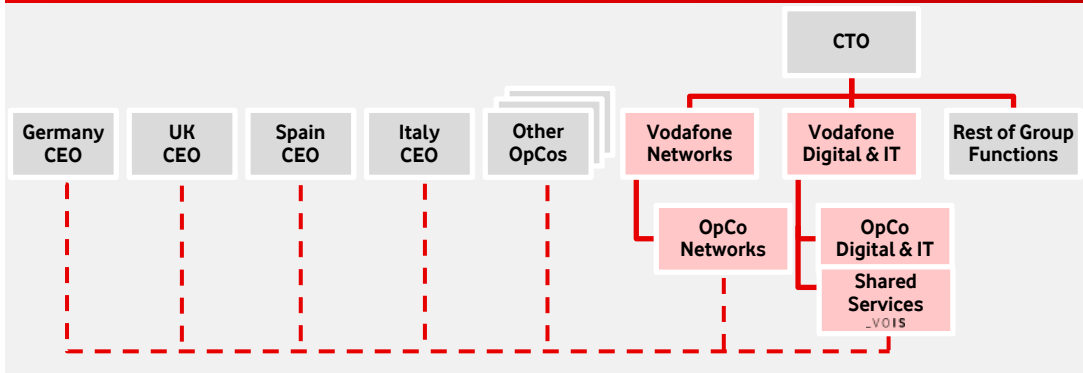


## Unlocking efficiency

Under our legacy operating model, technology decisions had to be aligned across 11 European markets

**As of April , Networks and Digital & IT functions in Europe now report directly to the CTO, enabling a better, faster and more efficient organisation**

## Our new operating model – Implemented in April



Scale enables deep expertise to be shared and work to be insourced



Standardised processes and tools enable rapid development



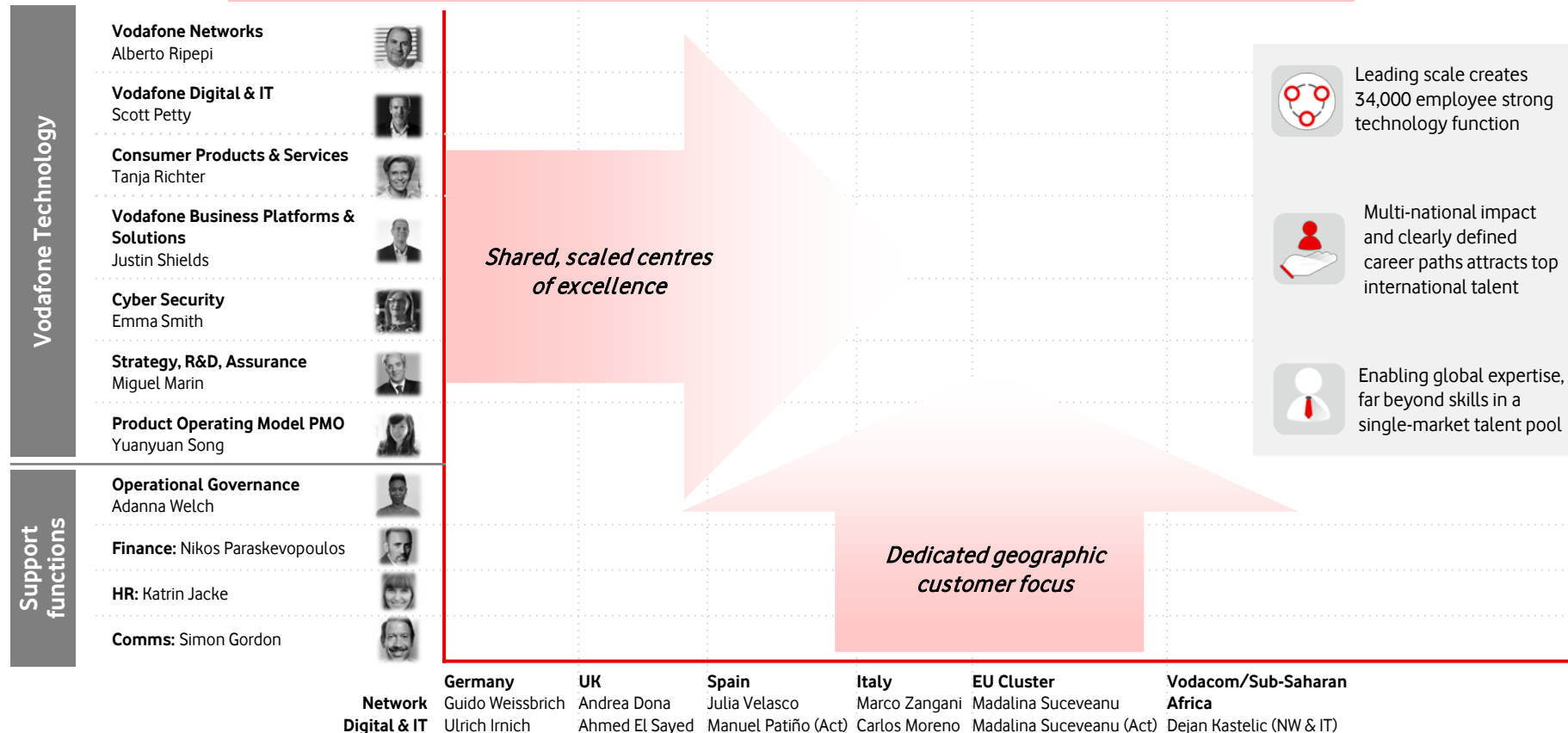
Software and code can be built once and reused



Enabling operational excellence and efficiency

# B: We have the right team and capabilities to deliver

## Matrix organisation to optimise blend of technical & functional expertise with deep local knowledge



# B: We have the right team and capabilities to deliver

## One global team – 34,000 employees

### IT & Digital

- 17,000 employees working across project management, application development, maintenance, testing and operations and office IT

### Networks

- 14,000 employees across design and engineering, operations, architecture and service enablement

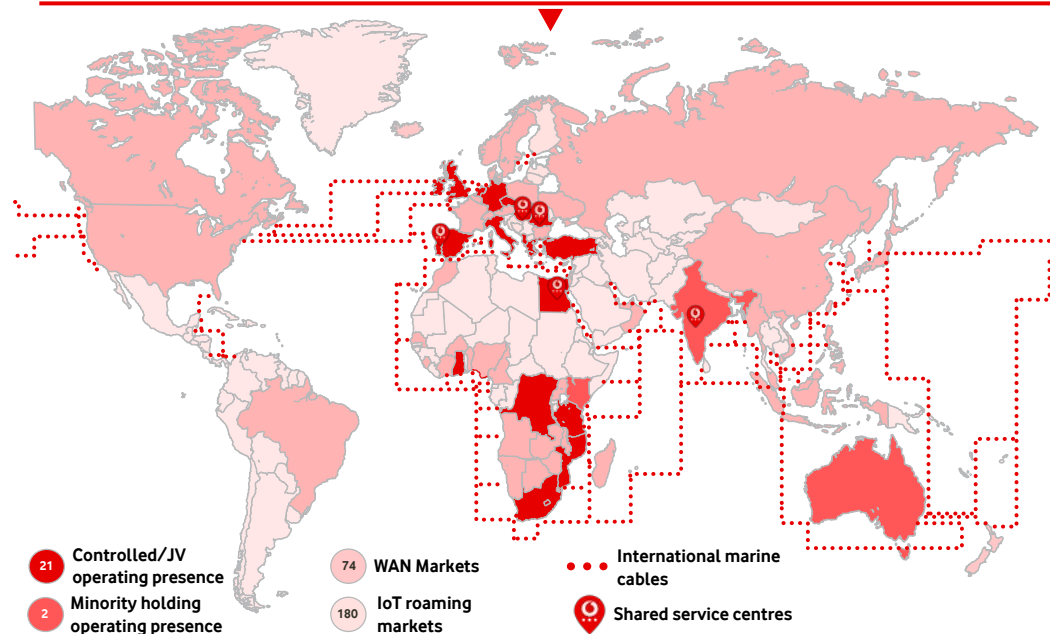
### Other

- 3,000 employees across cybersecurity, R&D, product and service development, strategy



Of which, 12,000 employees in shared service centres in India, Egypt, Romania, Hungary and Portugal

## Global capabilities



2,900 patents granted, c.600 patents pending

Leadership team part of >40 industry boards

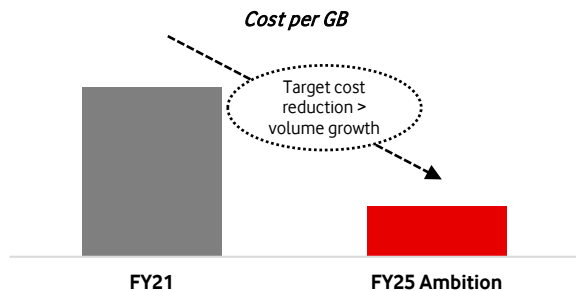
7,000 software engineers

Data centres host c.100,000 servers

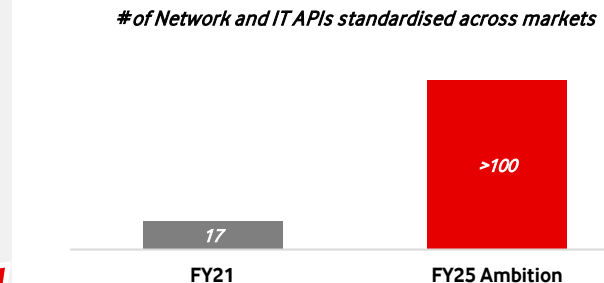
# C: We have a clear vision to drive growth



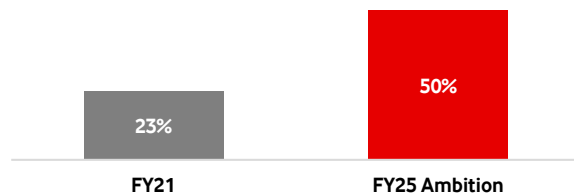
## Cost per GB



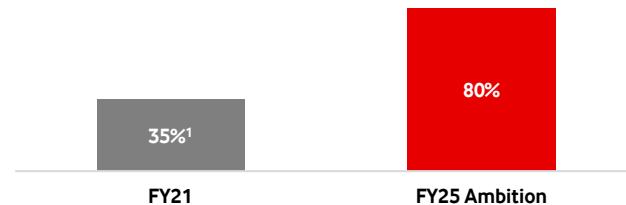
## Standardised APIs



## Share of Technology employees in Software Development



## % of Network incidents automatically managed E2E



## Employees

## Automate








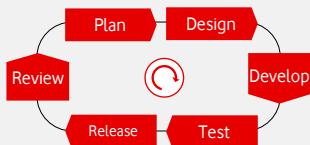
# C: We have a clear vision to drive growth

## New product operating model

### New product framework

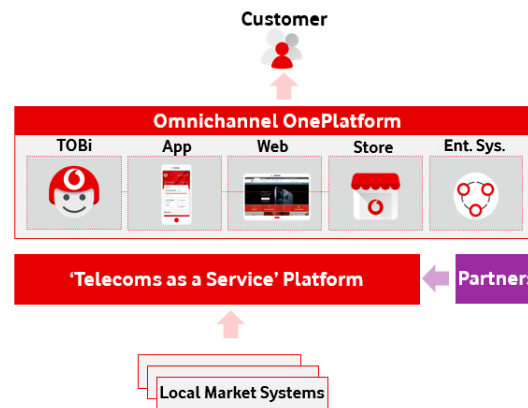
-  Dedicated, global product managers
-  Business cases assessed globally
-  Global product board to provide oversight

### Supported by Agile development



Drives **cross-functional ownership** and **continuous improvement**

## Platform approach



Build products once and redeploy everywhere, whilst attracting partners

## New Generation culture

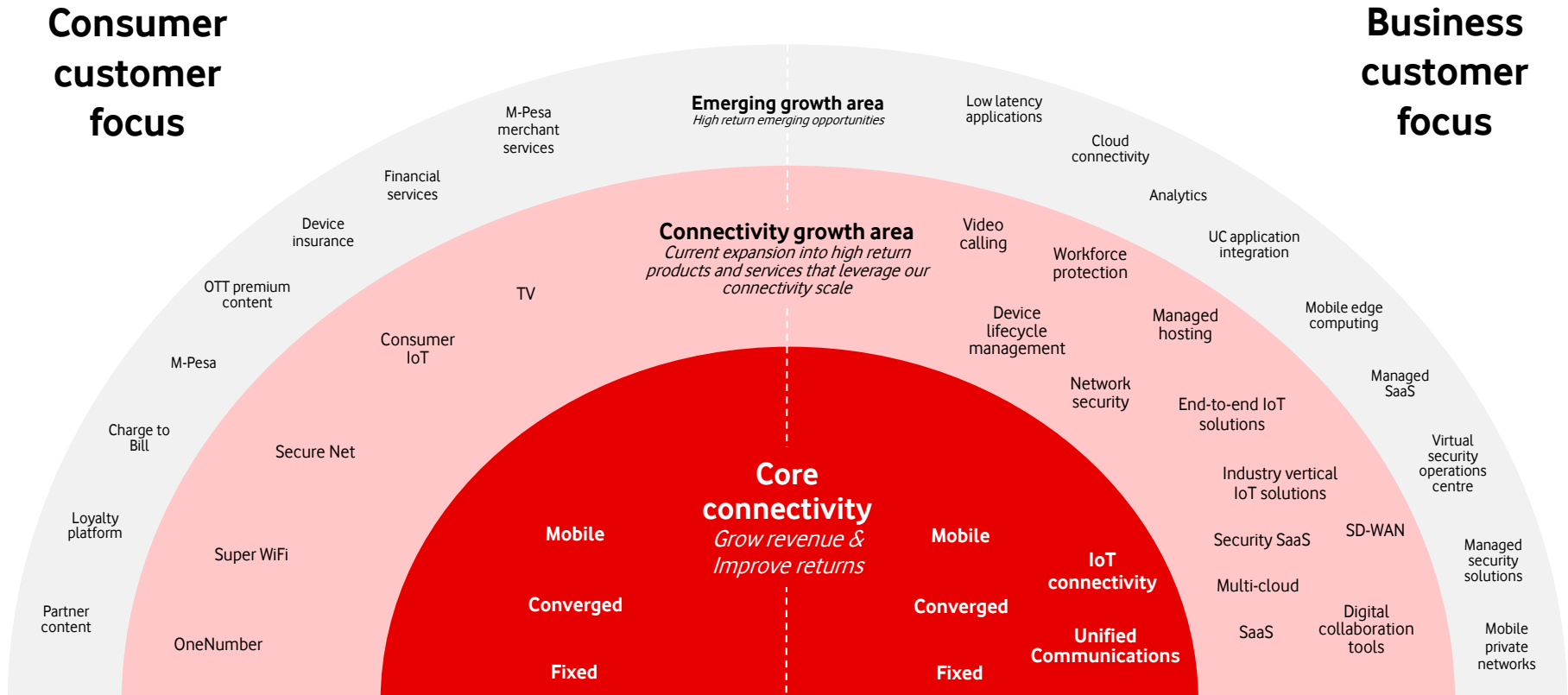
- Globally **standardised** development practices, improving efficiency
- Experiment** and make calculated bets
- Increase **in-house software** development as we become more efficient
- Develop own Intellectual Property** where there is a clear right-to-win

From a Telco to a **New Generation Connectivity** and **Digital Services culture**

Industrialising high ROCE product creation for Business and Consumer

**FY25 Ambition to reduce product lead times by 50%**

# C: We have a clear vision to drive growth



# D: We are enabling new digital products and services

## Platform capabilities

### Global

- Supports connections in >180 markets and 570 networks, used by 16 partner markets
- SIMs can easily convert from global to local and back to comply with local regulations

### Scalable

- Cloud-native, can be easily scaled to meet demand from up to one billion devices
- 60% increase in data growth YoY
- >72bn km of driving data analysed

### Flexibility & Innovation

- Platform can meet both Consumer and Business demand, across sectors
- >500 IoT experts

### Speed

- New products and services can be onboarded rapidly as standardised code can be redeployed

### Security

- Security embedded into the platform at the network-level

### Integrated

- Easily integrated with other systems, handles 1.7bn API calls a month
- Toolkit for third-party developers to create their own software on top of the platform

Built and continuously improved over 10 years

One global, self-built IoT platform

7-time Gartner Magic Quadrant leader<sup>1</sup>

## Business



>123m connected devices, >100E2E use cases

## Consumer



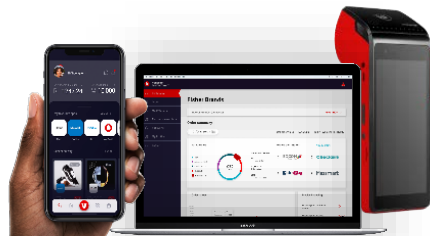
1.4m connected devices, >20 products

# D : We are enabling new digital products and services

## 13m Financial Services users in South Africa



*In SA, we offer financial services ranging from peer-to-peer payments and merchant services to loans and e-commerce. We will launch our super-app proposition, VodaPay, in the coming months*



### AI

- AI-based risk model instantly processes 4.3m Airtime Advance transactions per day
- AI-based credit modelling enables low bad debt rate of only 0.5%

### Scalable

- >2000 merchants with in-store sales terminals
- Data lake processes ZAR200bn of transactions per annum

### Flexible

- Platform offers insurance, lending, payment, saving, trading, e-commerce, content and third-party services
- Serves both Consumer and Business customers

### Integrated

- New VodaPay smartphone app launching in the coming months, designed for deep partner integration – South Africa's app store

## 48m M-Pesa users



*M-Pesa is our financial services platform in sub-Saharan Africa and Egypt, which is expanding into digital and business services*



### International

- One platform across 7 African markets

### Scalable

- Cloud-enabled, supporting 15.2bn transactions per annum, growing >20% per annum
- 48m users, c.1 million agents, >350k merchants

### Flexible

- One platform for both Consumer and Business
- Handles peer-to-peer, merchant services, loans and is increasingly expanding into more services

### Integrated

- >20 APIs enabling plug and play capabilities
- 6 mini-applications live, 40 more apps in the pipeline across Consumer and Business

## Leading Financial Services platform in Africa with 61m customers

# D: We are enabling new digital products and services

## >10 Mobile private networks live across 6 verticals

*MPN offers guaranteed bandwidth, low latency, high availability and reliability in order to enable business-critical services*



### Scalable

- Leverages our leading spectrum positions and IoT customer channels and applications

### Insight

- Utilises our leading expertise at building and managing networks at scale

### Integration

- Partner integration to offer over the top solutions, alongside integration with our wider network for seamless customer device transitioning

### Flexible

- Solutions across six different sectors

### Speed

- Over 10 MPNs already live, including Ford's factory of the future

## Distributed Multi-access Edge Computing

- MEC leverages our leading networks and IoT capability
- Integrating AWS into strategic locations in the network
- This reduces latency, creating multiple new use cases which we are seeing demand from today

**Video case study with AWS here:**  
[investors.vodafone.com](https://investors.vodafone.com)



## Security

- Strategic partnership with Accenture to create enterprise-grade end-to-end cybersecurity services
- 24/7 Security Operations Centre running 365 days a year to ensure rapid incident response
- 750k security licences across 17 solutions



# Summary: We are transforming to deliver growth

## Tech:2025

### What we'll look like



Reliable, high-speed & efficient convergent networks



Always-on & zero-touch operational excellence



Most efficient and simplified operator



Product operating model & scaled platform architecture with standard APIs



Culture of innovation & collaboration, embedding leading practice

### Our ambition



60% 5G built-right population coverage, >51m on-net gigabit homes in Europe



80% of network incidents automated end-to-end



Data volume growth met or exceeded by cost per GB reduction



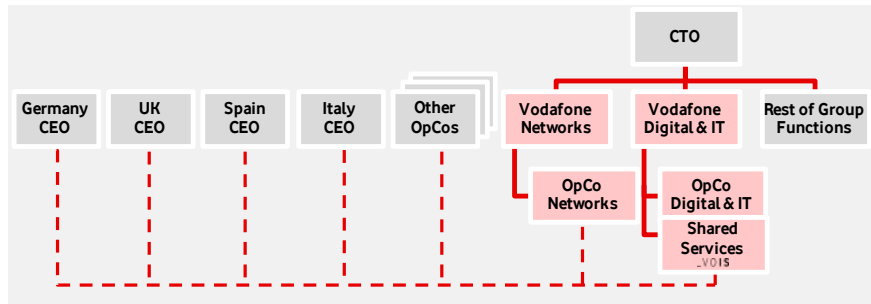
50% reduction in product lead times



Enabling consistent revenue and ROCE growth

# Summary: We are transforming to deliver growth

## 1 We have transformed our operating model

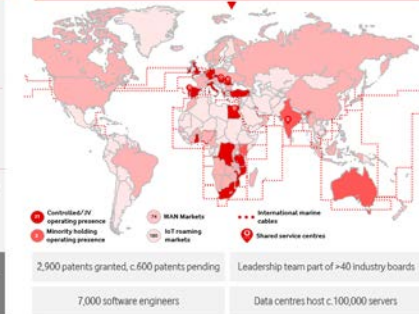


## 2 We have the right team and capabilities to deliver

### One global team – 34,000 employees

|   |  |
|---|--|
| IT & Digital  | <ul style="list-style-type: none"> <li>17,000 employees working across project management, application development, maintenance, testing and operations and office IT</li> </ul> |
| Networks  | <ul style="list-style-type: none"> <li>14,000 employees across design and engineering, operations, architecture and service enablement</li> </ul>                                |
| Other   | <ul style="list-style-type: none"> <li>3,000 employees across cybersecurity, R&amp;D, product and service development, strategy</li> </ul>                                       |
| <p>Of which, 12,000 employees in shared service centres in India, Egypt, Romania, Hungary and Portugal.</p> |  |

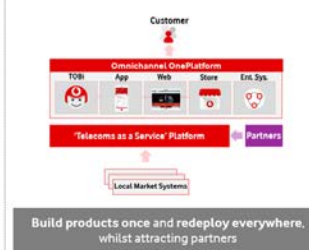
### Global capabilities



### New product operating model



### Platform approach

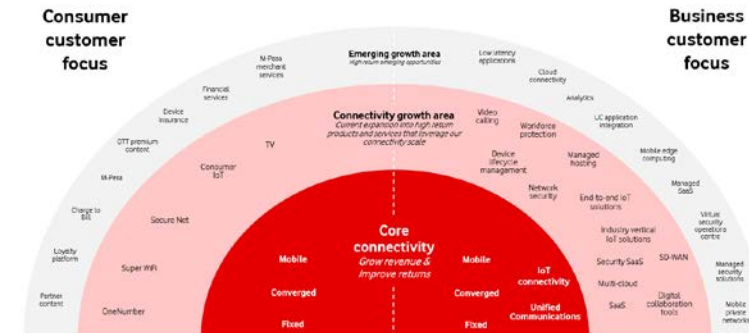


### New Generation culture

- Globally **standardised** development practices, improving efficiency
  - Experiment** and make calculated bets
  - Increase **in-house software** development as we become more efficient
  - Develop own Intellectual Property** where there is a clear right-to-win
- From a Telco to a New Generation Connectivity and Digital Services culture

## 3 We have a clear vision to drive growth

## 4 We are enabling new digital products and services



# Appendices

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| II | Importance notice | <i>p66</i> |



# Appendix I : Definitions

| Term             | Definition   |
|------------------|--|
| 2G/3G/4G/5G      | Cellular technologies that enable voice and data services. 2G stands for 2nd generation etc.   |
| AI/ML            | Artificial intelligence / machine learning   |
| API              | Application programming interface, a software intermediary that allows two applications to talk to each other  |
| AR/VR            | Augmented reality/virtual reality  |
| AWS              | Amazon Web Services  |
| Connections      | The number of devices or products that we connect  |
| CPaaS            | Communications Platform as a Service   |
| CRM              | Customer relationship management systems   |
| DXL              | Digital experience layer: an intermediary software layer that decouples customer facing systems from legacy systems improving time to market   |
| E2E              | End-to-end   |
| EM               | Emerging markets   |
| FCF              | Free cash flow   |
| Exabyte/Petabyte | A petabyte is equal to 1,000,000 gigabytes. A exabyte is 1,000 petabytes   |
| Gbps / Mbps      | Gigabits (billions) / megabits (millions) of bits per second   |
| IoT              | Network of physical objects embedded with electronics, software, sensors & network connectivity, including built-in mobile SIM cards, that enables collection of data & exchange communications with one another or a database |

| Term         | Definition  |
|--------------|---|
| IRR          | Internal rate of return   |
| MEC          | Multi-access edge computing: embedding compute servers closer to the edge of the network in order to reduce latency |
| Massive MIMO | Multiple-in multiple-out antennas, 'massive' as they can have a large number of antennas per array                  |
| MPN          | Mobile Private Networks   |
| NFV          | Network function virtualisation   |
| NOC          | Networks operation centre   |
| NPS          | Net promoter score, a measure of customer sentiment   |
| RAN          | Radio access network  |
| ROCE         | Return on capital employed  |
| SaaS         | Software as a service   |
| SDN          | Software defined networks   |
| SD-WAN       | Software defined wide area networks   |
| Self-built   | Fixed networks that are fully owned by Vodafone   |
| SOC          | Security operations centre  |
| UC           | Unified communications & collaborations products and software   |
| VOLTE        | Voice over LTE (data)   |

# Appendix II : Important notice

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## Upcoming events



**23  
July**

Q1 FY22 trading update



**27  
July**

Annual General Meeting



**29  
Sep'**

Digital services & experiences  
investor briefing